ROTEL®

RA-1412

STEREO INTEGRATED AMPLIFIER

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TECHNICAL MANUAL

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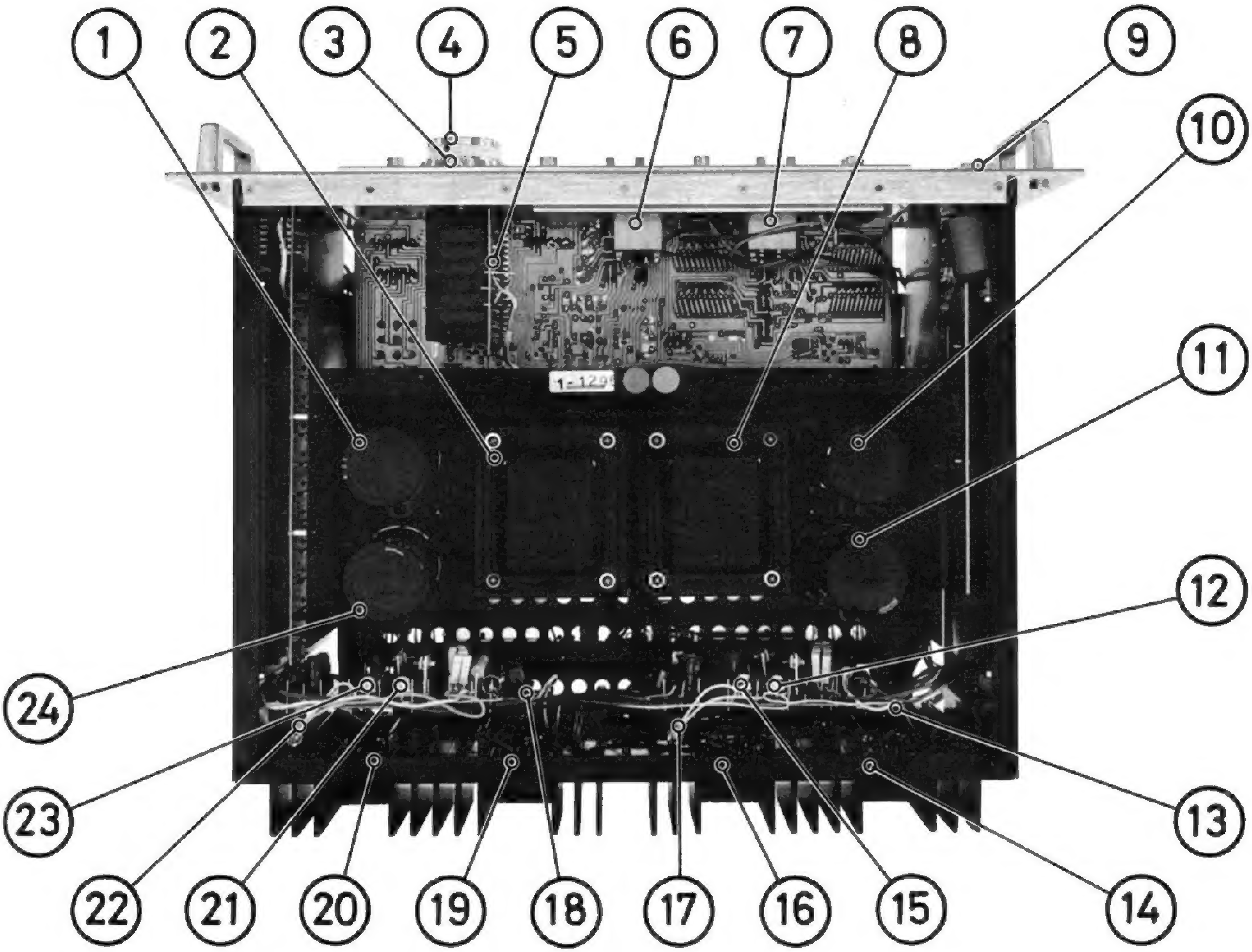

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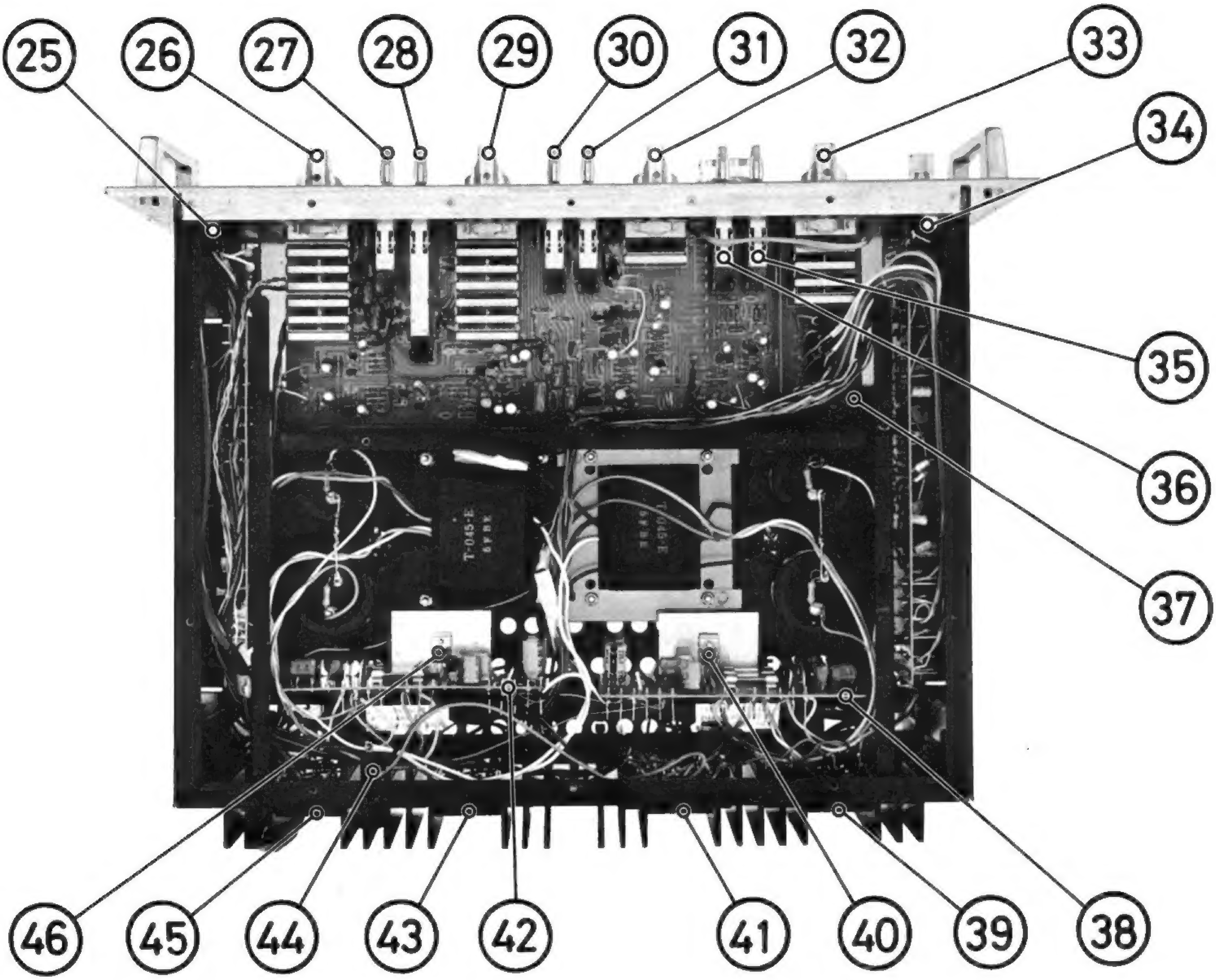

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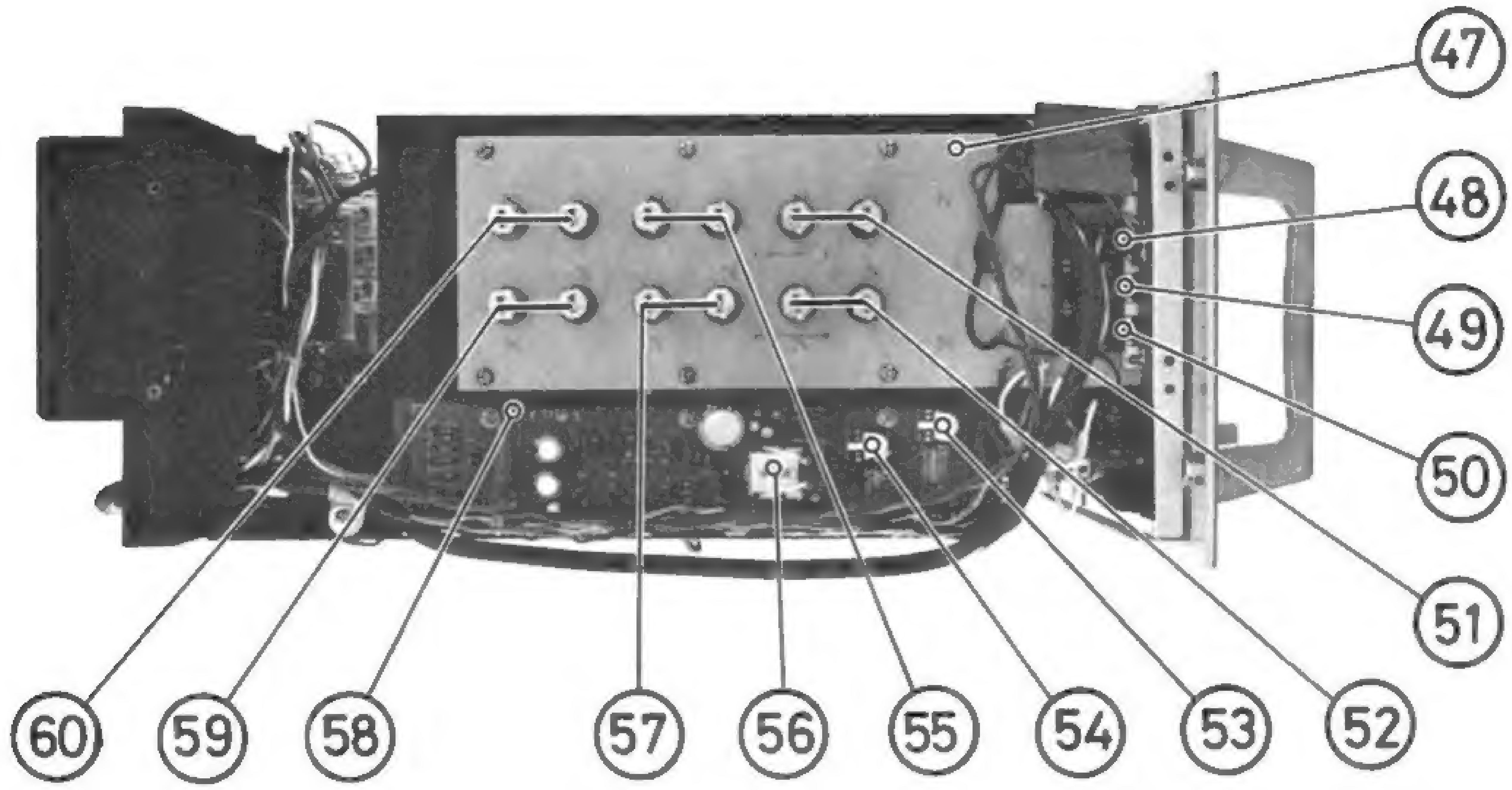

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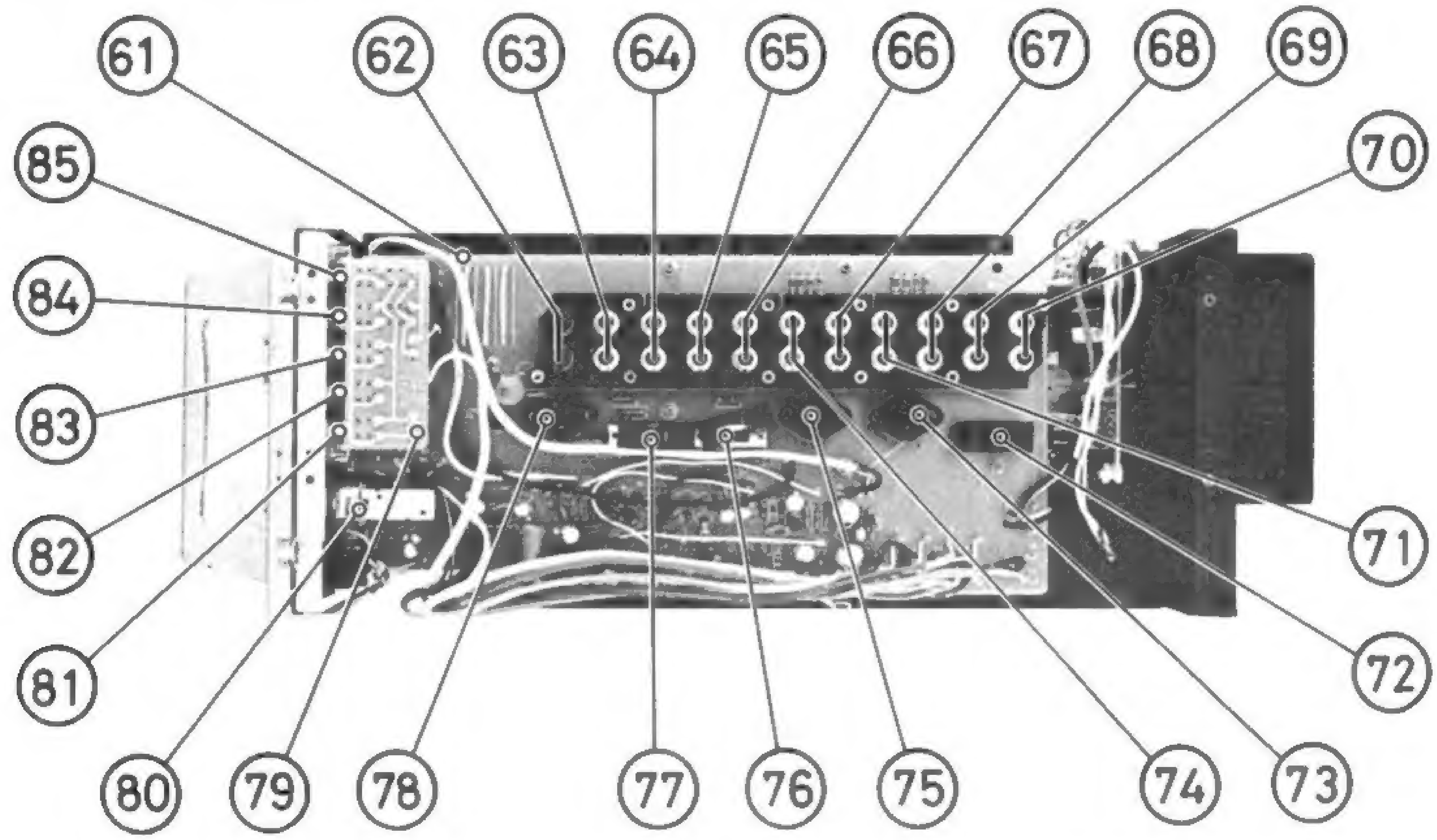

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85. PHONO-1 SWITCH

DISASSEMBLY OF UNIT

1. Remove Top Cover. (Fig. 1-1, remove screws A-J.)
2. Remove Bottom Cover. (Fig. 1-2, remove screws 1-10.)
3. Remove Front Panel.
   a) Remove all knobs (Fig. 1-3, knobs A-K) except Push Switch.
   b) Unscrew the 4 mounting screws on left and right panels (Fig. 1-3, screws 9-12).
   c) Unscrew the 8 mounting screws on upper and lower portions. (Fig. 1-3, screws 1-8).

   Note: When removing the panel, be careful not to touch the screws that fix the handle to the panel. Follow exactly the procedures in Phase b).

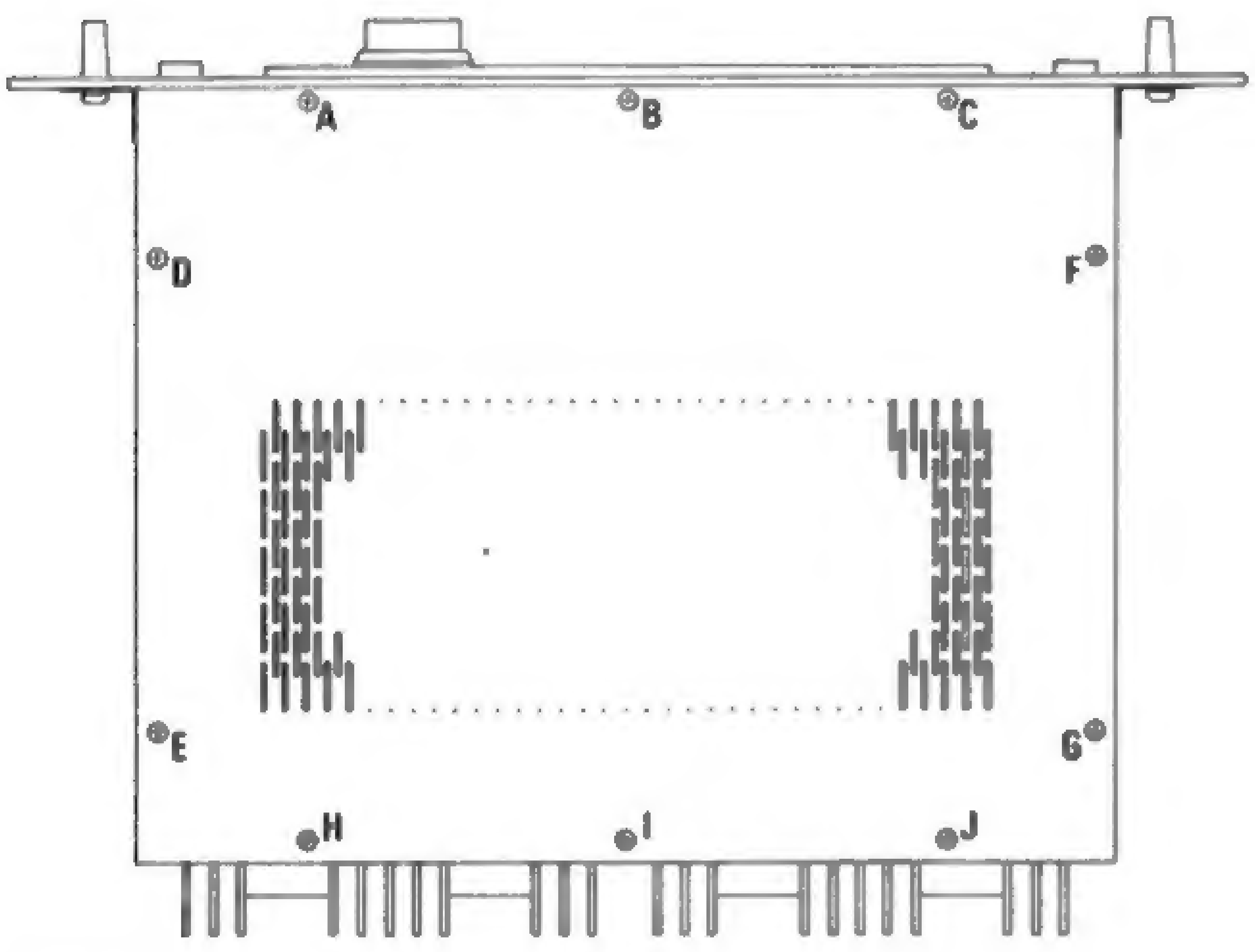


Fig. 1-1 TOPVIEW

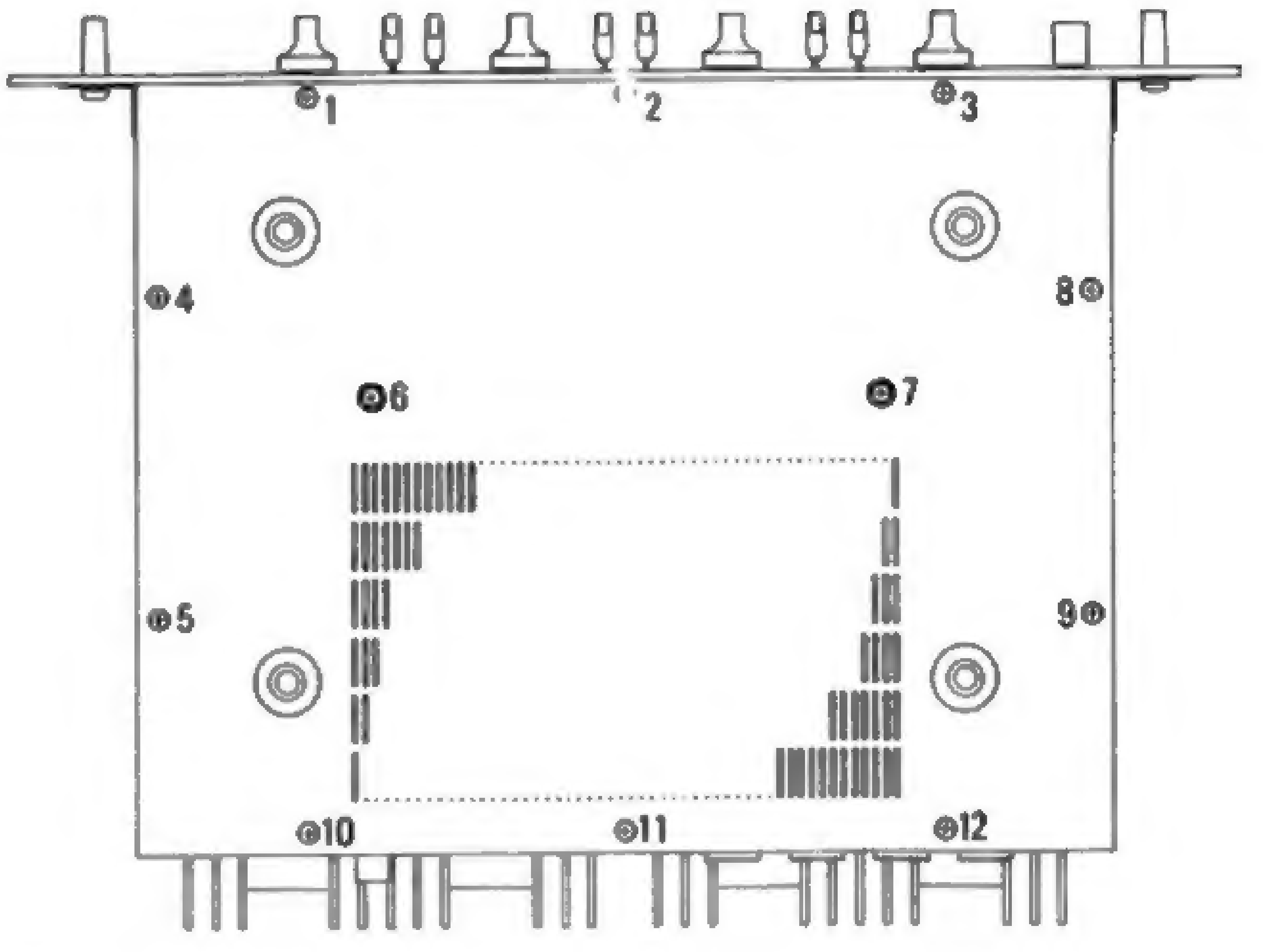


Fig. 1-2 BOTTOM VIEW

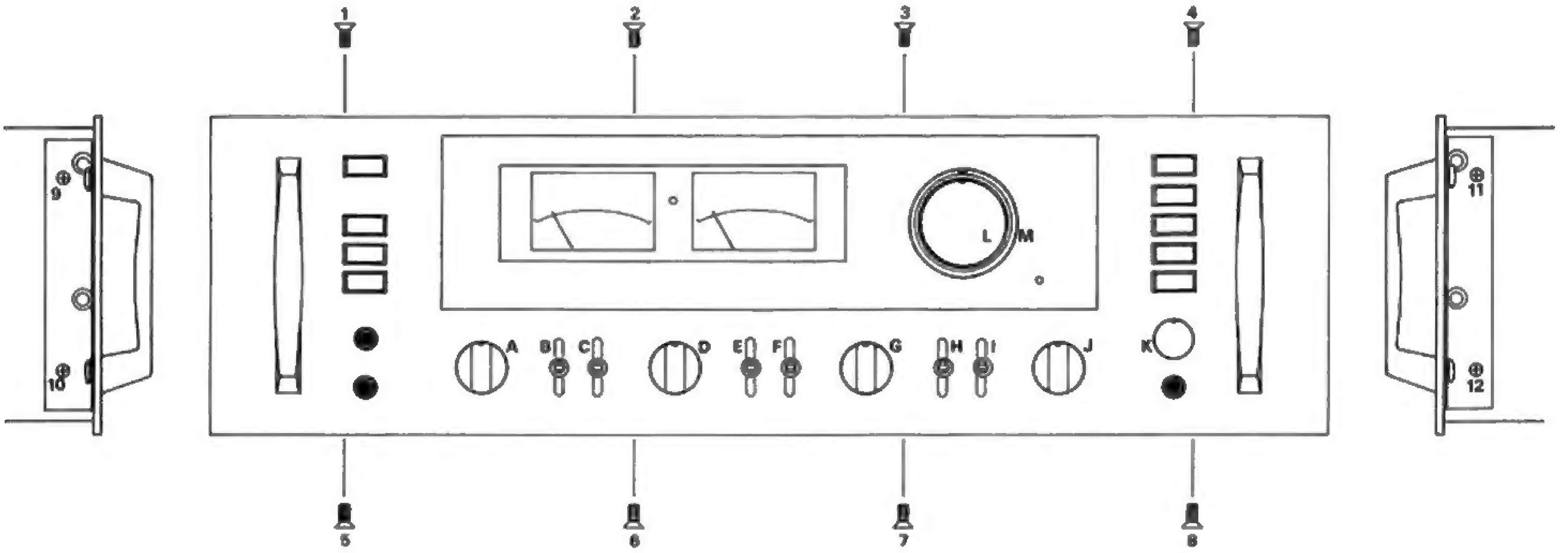


Fig. 1-3 FRONT PANEL

4. How to Remove Phono Amp. PCB.
   a) After completing procedures 1 to 3, remove the side panel by unscrewing the 4 side panel mounting screws (Fig. 1-5, screws 1, 2, 7 and 8) and the 22 terminal mounting screws on the indicator panel (Fig. 1-5, screws 9-30).
   b) Remove the 5 function knobs (Fig. 1-4, knobs A-E).
   c) Unscrew the 2 function switch mounting screws (Fig. 1-4, screws 1 and 2).
   d) Remove the 2 mounting nuts on MIC JACK and MIC VOL., respectively. (Fig. 1-4, nuts 3 and 4).
   e) Unscrew the 6 Phono Amp. PCB mounting screws (Fig. 1-6, screws 1-6).

5. How to Detach Output Terminal PCB and Overload Protection PCB.
   a) After completing procedures 1 to 3, remove the left side panel by unscrewing the 4 left side panel mounting screws. (Fig. 1-7, screws 1-4).
   b) Detach Output Terminal PCB.
      1) Remove the 4 knobs for power switch and speaker switch (Fig. 1-4, knobs F-1), and 2 switch mounting screws (Fig. 1-4, screws 5 and 6).
      2) Unscrew the 2 headphone jack mounting screws (Fig. 1-4, screws 7 and 8).
      3) Unscrew the 6 Output Terminal PCB mounting screws)Fig. 1-8, screws 1-6).
   c) To detach Overload Protection PCB, after completing the procedure in Phase a), unscrew the 6 Overload Protection PCB mounting screws (Fig. 1-8, screws 7-12).

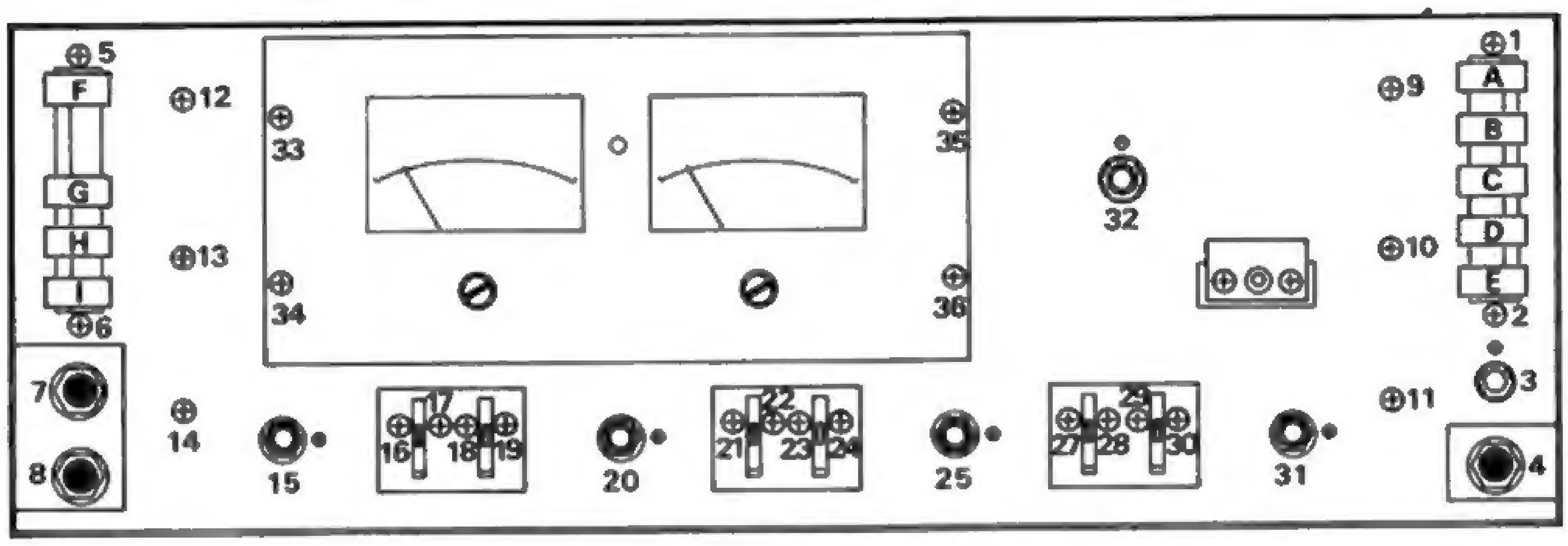


Fig. 1-4 FRONT CHASSIS

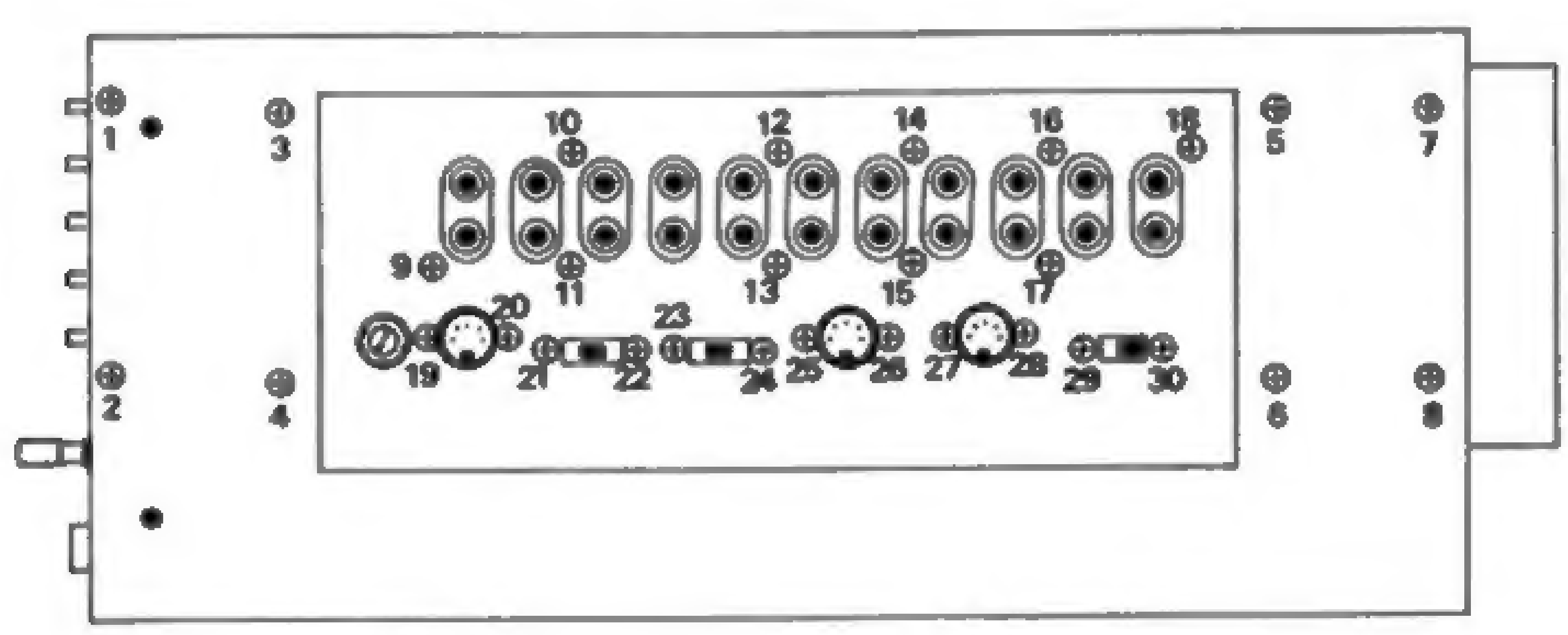


Fig. 1-5 RIGHT SIDE VIEW (1)

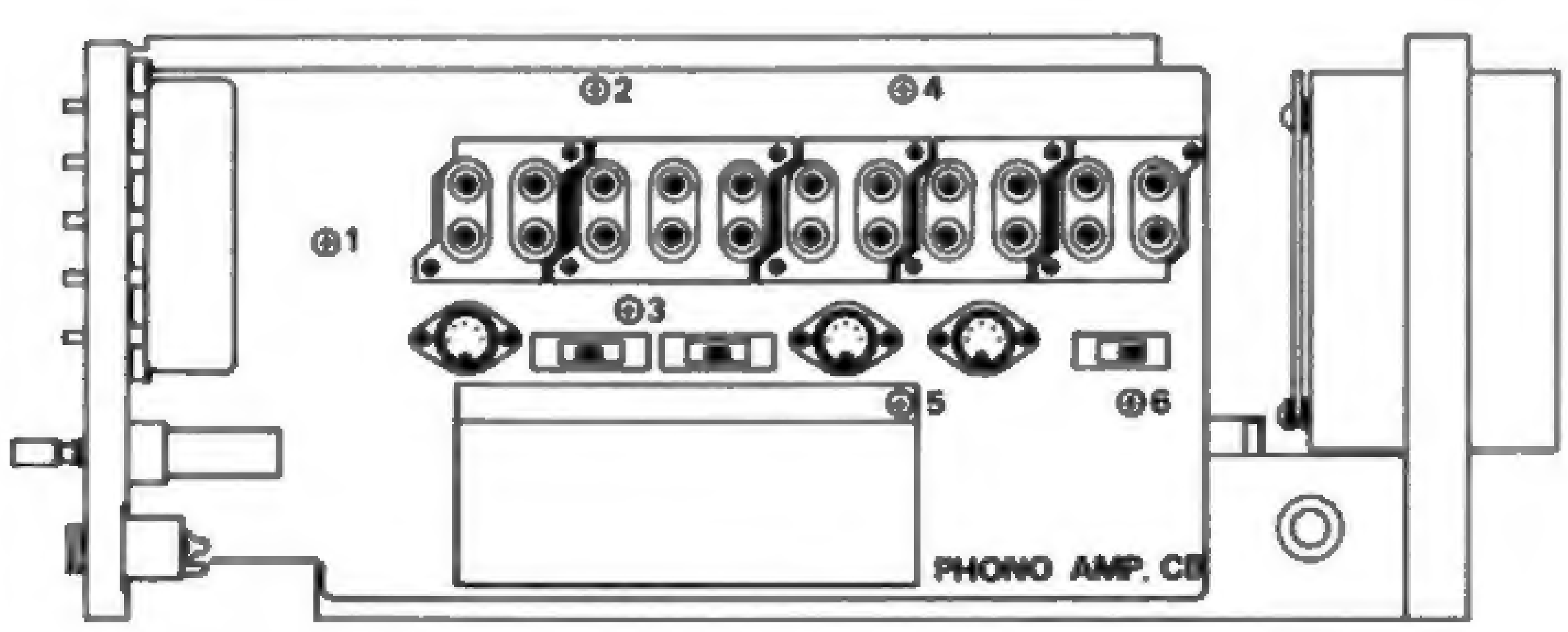


Fig. 1-6 RIGHT SIDE VIEW (2)

6. How to Detach WATTS METER
   a) After completing procedures 1 to 3, unscrew the 4 meter decoration board mounting screws (Fig. 1-4, screws 33-36).
   b) Remove the meter mounting nut on the rear side of meter.
7. How to Detach Volume Control and Tone Control Amp. Boards.
   a) After completing procedures 1 to 3, remove the 9 knobs for FUNCTION POWER AND SPEAKER (Fig. 1-4, knobs A-1), and the 4 switch mounting screws (Fig. 1-4, screws 1, 2, 5, and 6).
   b) Remove the 4 mounting nuts for MIC VOL., MIC JACK and PHONE JACK. (Fig. 1-4, nuts 3, 4, 7 and 8).
   c) Unscrew the 6 front chassis mounting screws, and pull front chassis out toward you.
   d) Remove mounting screws and nuts for all controls on the front chassis (Fig. 1-4, screws, nuts 15-32) 12 screws and 5 nuts), and detach Tone Control Amp. PCB from front chassis.
8. To Remove Left Side Panel Without Removing Front Panel. (as in the case of replacing overload protection relay or adjusting calibration of WATTS METER only.)
   a) After completing procedures 1 and 2, unscrew the 2 left side panel nounting screws. (Fig. 1-4, screws 9 and 10).
   b) Next, after unscrewing the 8 side panel mounting screws and indicator board mounting screws (Fig. 1-7, screws 1-8), remove the side panel, by holding the side adjacent to the rear panel and pulling it out toward the rear. Remove the indicator board.
9. How to Remove Main Amp. PCB.
   a) After completing procedures 1 and 2, detach varistor by unscrewing the varistor mounting screw (1) in Fig. 1-9, and unscrew Main Amp PCB mounting screws (2) and (3) in Fig. 1-9. Remove the PCB by pulling it upwards.
10. Follow disassembly procedures in exact reverse to reassemble.

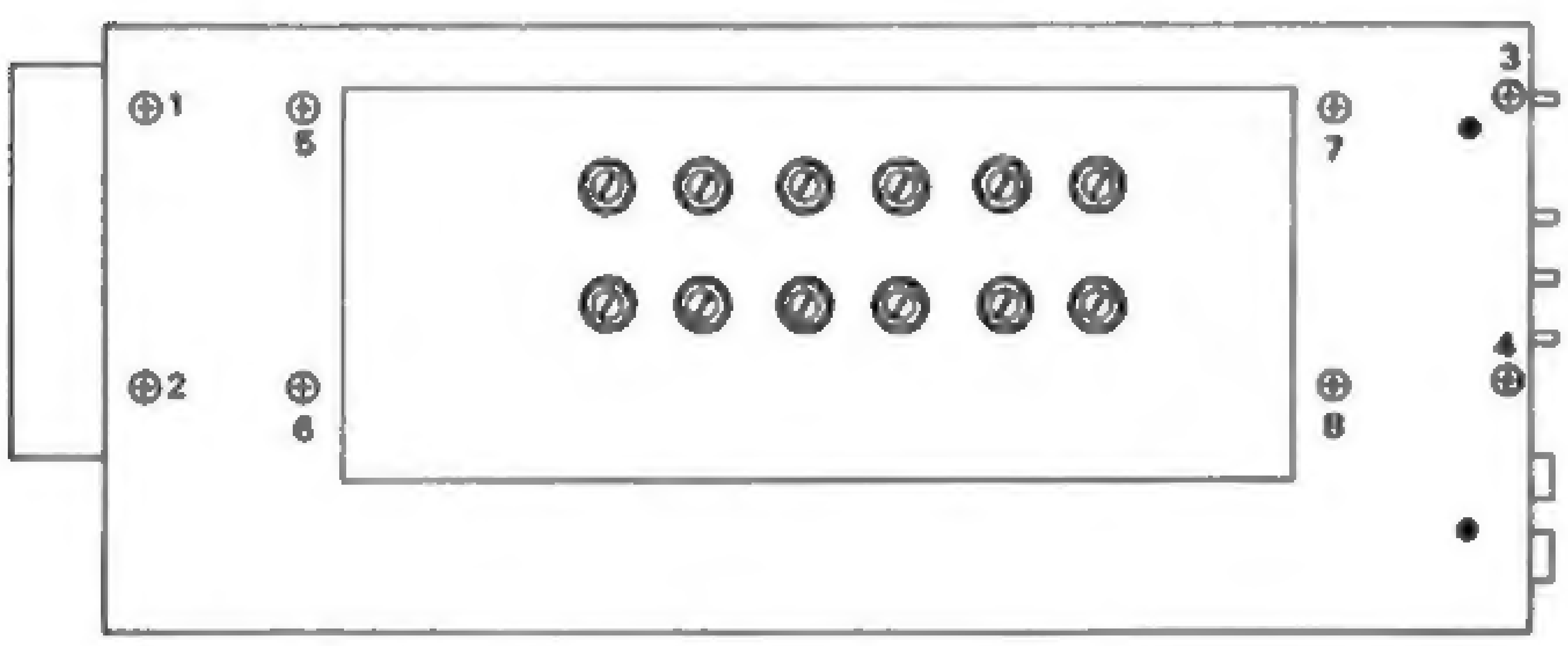


Fig. 1-7 LEFT SIDE VIEW (1)

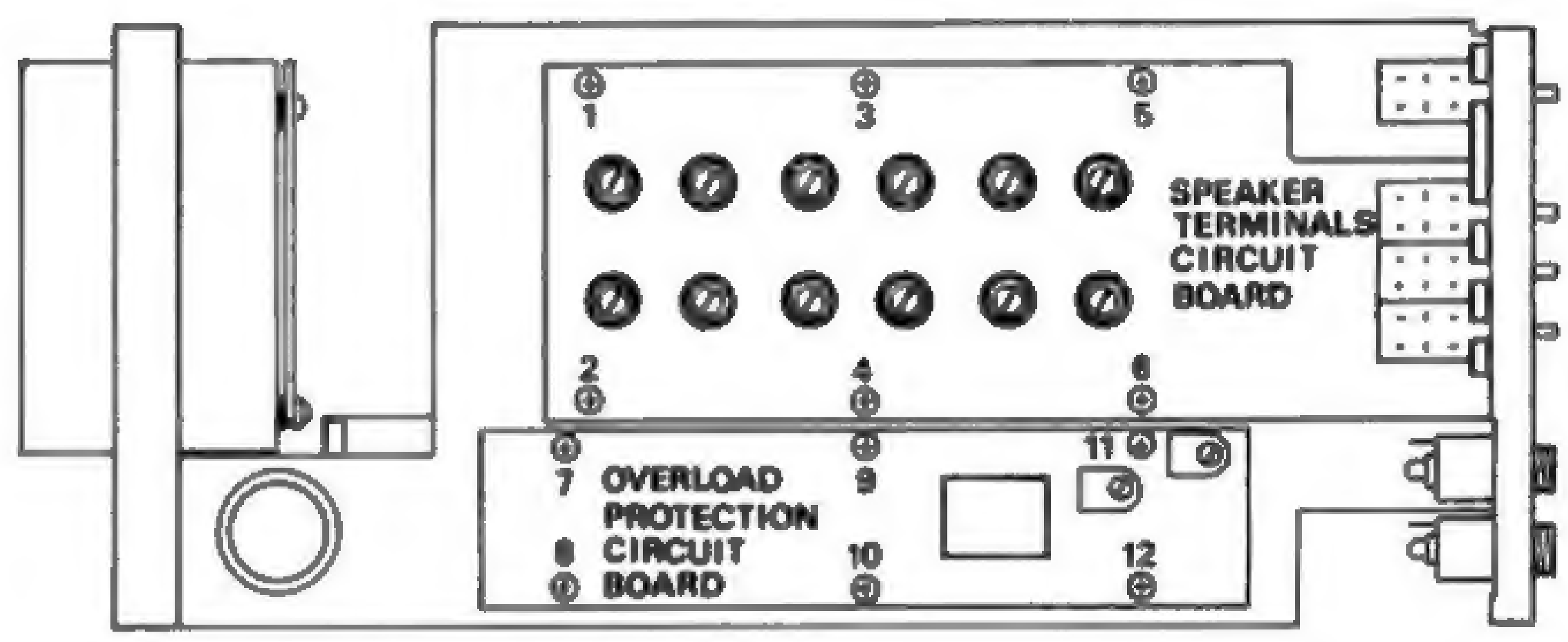


Fig. 1-8 LEFT SIDE VIEW (2)

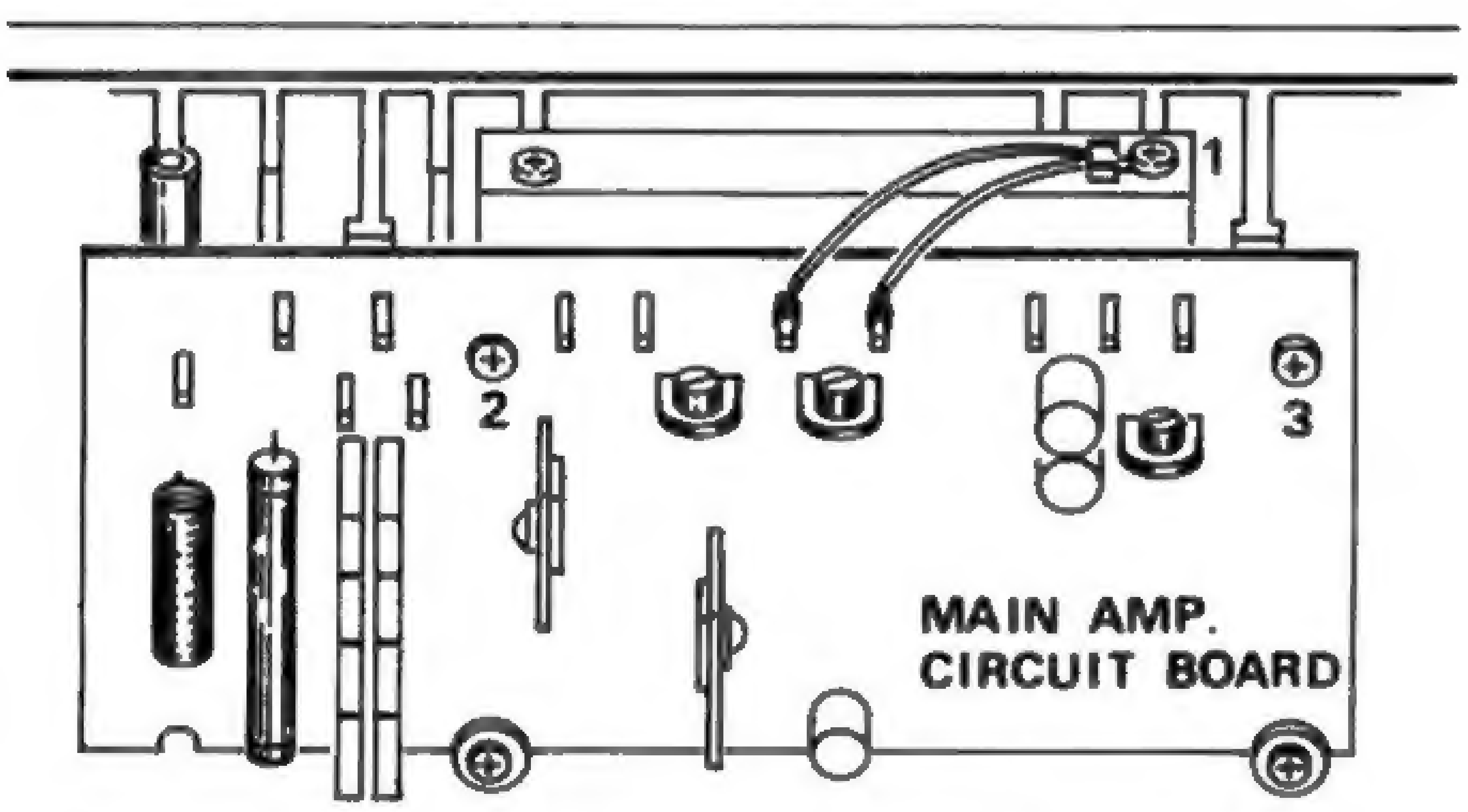


Fig. 1-9 CHASSIS TOP VIEW (MAIN AMP. PORTION)

PRECAUTIONS

1. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.
2. Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.
3. Replacements for output and driver transistors, if necessary, must be made from the same hfe group as the original type.
4. If one output transistor burns out (open or short), always remove all output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohm-meter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.
5. When mounting a replacement power transistor, be sure the bottom of the flange, the mica inculators and the surface of the heat sink are free of forein matter, for they may cause transistors failure.
6. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat sink for better heat conduction.

POWER AMPLIFIER ADJUSTMENT PROCEDURE

1. DC BALANCE ADJUSTMENT

Instrument: DC VTVM (set up 3V range, utilizing Zero-point adjusting knob to obtain reading range between +1.5V and −1.5V, centered at 0.)

a. Set volume control to minimum. (i.e. no signal input).
b. Next, connect DC VTVM to Main Amp PCB. (Connect (+) lead wire to Pin5, and (−) lead wire to Pin E3.) See Fig. 2.
c. Adjust by turning potentiometer VR601 so that VTVM needle reads center (zero volts).

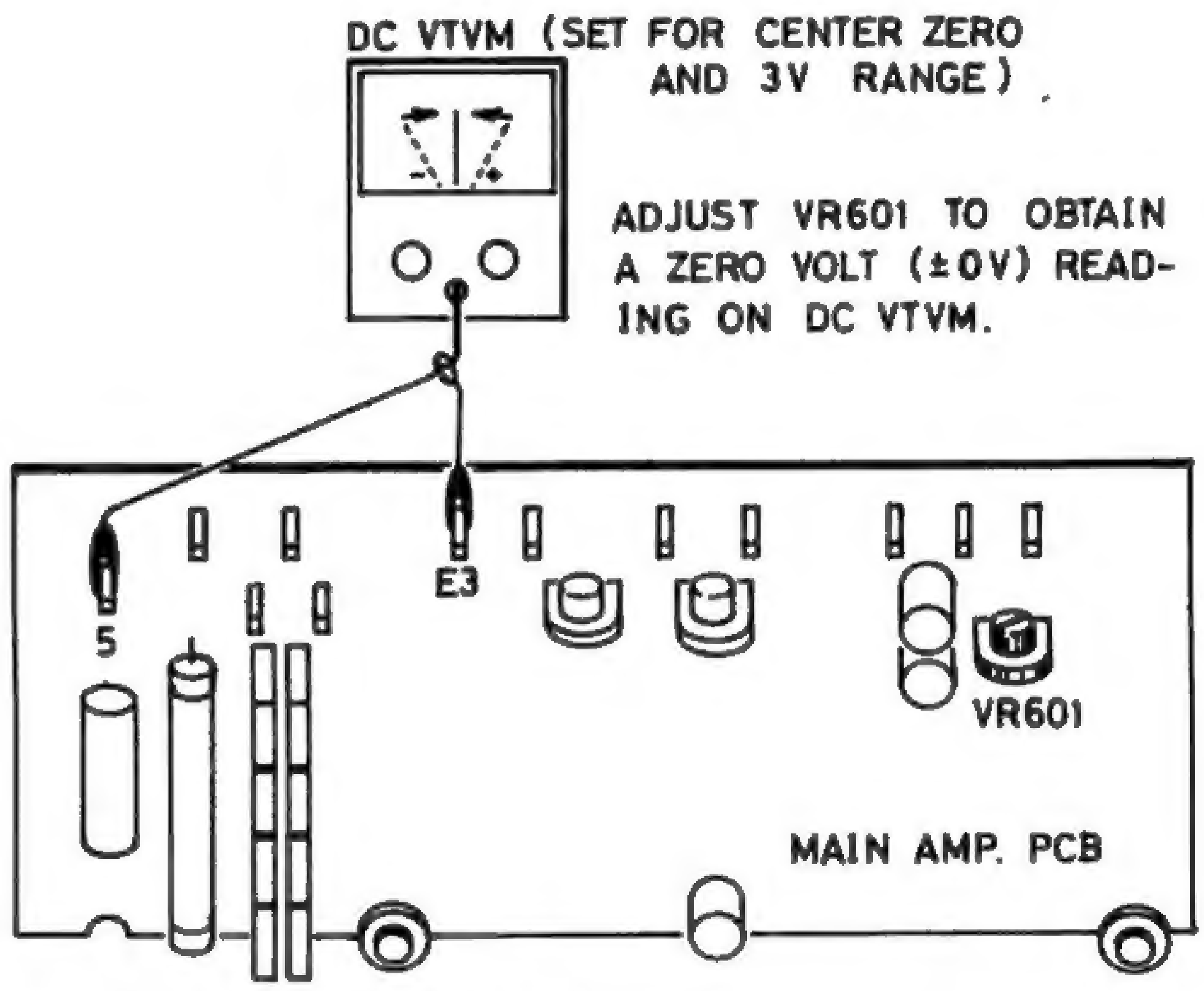


Fig.2 DC BALANCE ADJUSTMENT HOOK-UP

2. BIAS ADJUSTMENT

Note: Prior to bias adjustment, always give the set a preparatory run for several minutes, at rated output (at 8Ω) both channels driven.

Instrument: DC millivolt meter

a. Set volume control to minimum. (i.e. no signal input).
b. Connect DC millivolt meter to Test pin of Main Amp PCB See Fig. 3.
c. Adjust by turning potentiometer VR602 so that the meter reads 30mV.

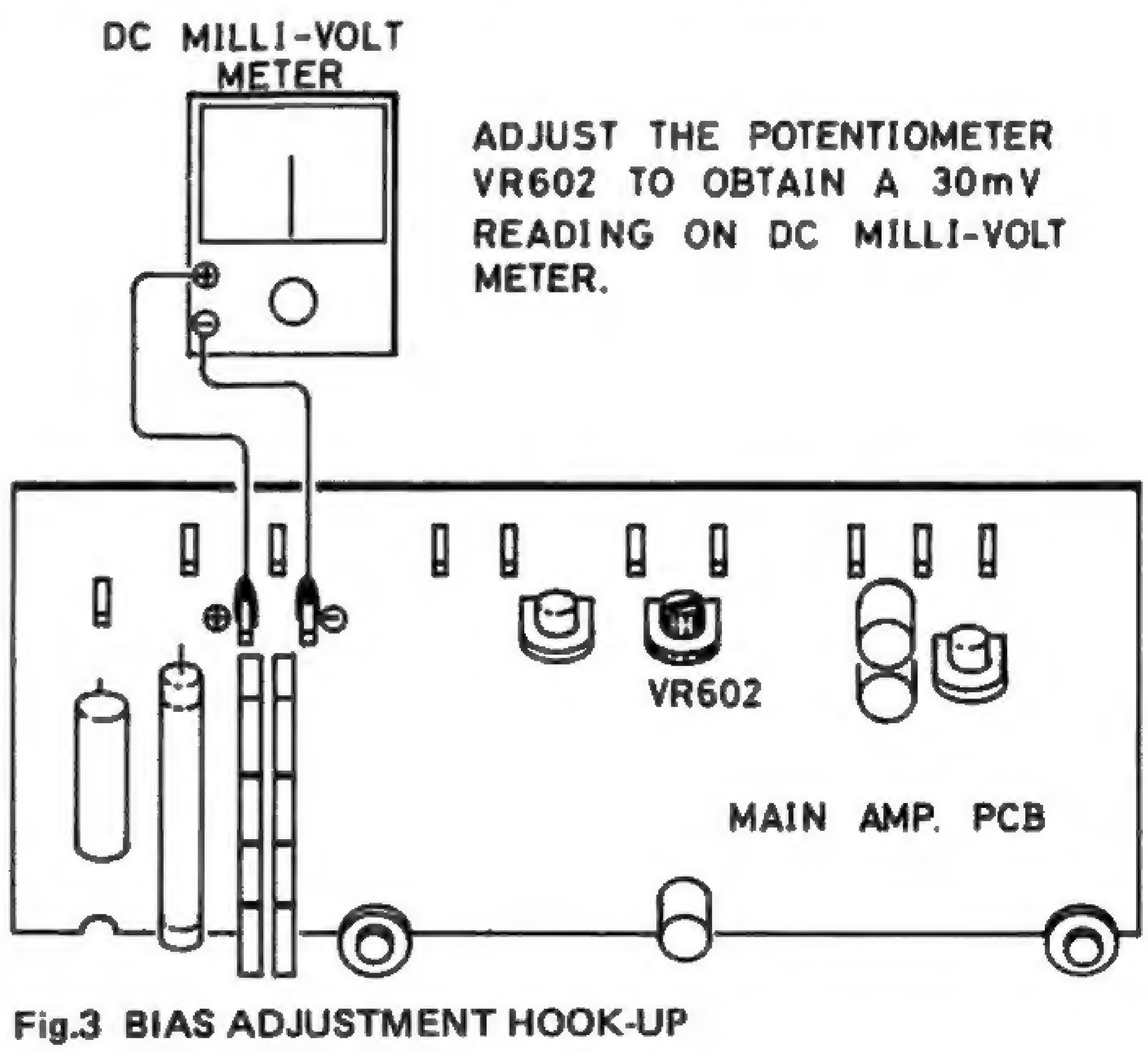


Fig.3 BIAS ADJUSTMENT HOOK-UP

3. OVERLOAD PROTECTION LEVEL ADJUSTMENT

Instruments: Audio Generator, AC VTVM and 4-ohm (200W) load resistor.

Make this adjustment for each channel, singly until protection relay goes to OFF (i.e. output voltage is zero.) under the following conditions:

a. Connect 4Ω (200W) non-inductive load resistor to speaker terminal, and connect it with AC VTVM in parallel to it.
b. Connect Audio Generator to Aux input terminal and apply 100Hz (sine wave) signal.
c. Set POWER to ON and adjust volume control or Audio Generator ATT so that AC VTVM reads 30V.
d. Adjust by turning potentiometer VR603 on the Main Amp PCB until protection relay goes to OFF (i.e. output voltage is 0 V). At this time, make certain that overload indicator on the front panel (centered between right and left meters) is illuminated.
e. Switch POWER to OFF, and complete the same adjustments from Phases (a)-(d) for the other channel.

*To reset overload protection circuit, power switch should be set to OFF first before resetting.

f. After completing level adjustment for both channels, apply 100Hz signal (sine wave) to both channels simultaneously, and make certain that overload protector is activated (i.e. relay goes to OFF and output voltage is zero.) when output voltage reaches the 24V ± 0.5V/4Ω level.

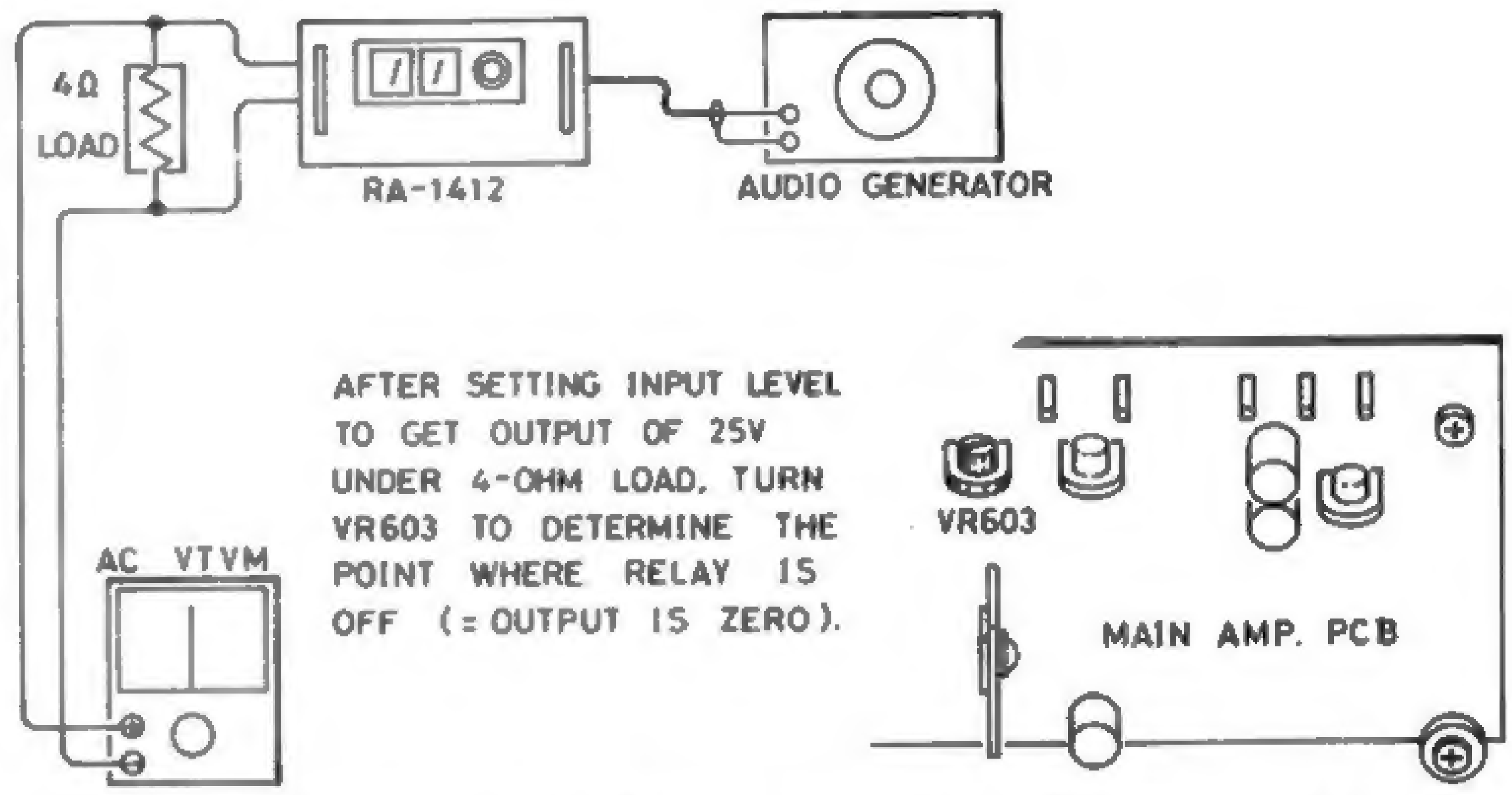


Fig. 4 OVERLOAD PROTECTION LEVEL ADJUSTMENT HOOK-UP

4. WATTS METER CALIBRATION

Instruments: Audio Generator, AC VTVM and 8Ω (50W) non-inductive load resistor.

a. Connect 8Ω (50W) load resistor to speaker terminal, and connect AC VTVM in parallel to it.
b. Connect Audio Generator to AUX input and apply 100Hz (sine wave) signals.
c. Adjust input signal so that AC VTVM reads 9V (i.e. 10W/8Ω).
d. In the Phase (c) state, adjust potentiometer VR701 (left channel) and VR702 (right channel) so that the Watts Meter reads 10W. See Fig. 5.

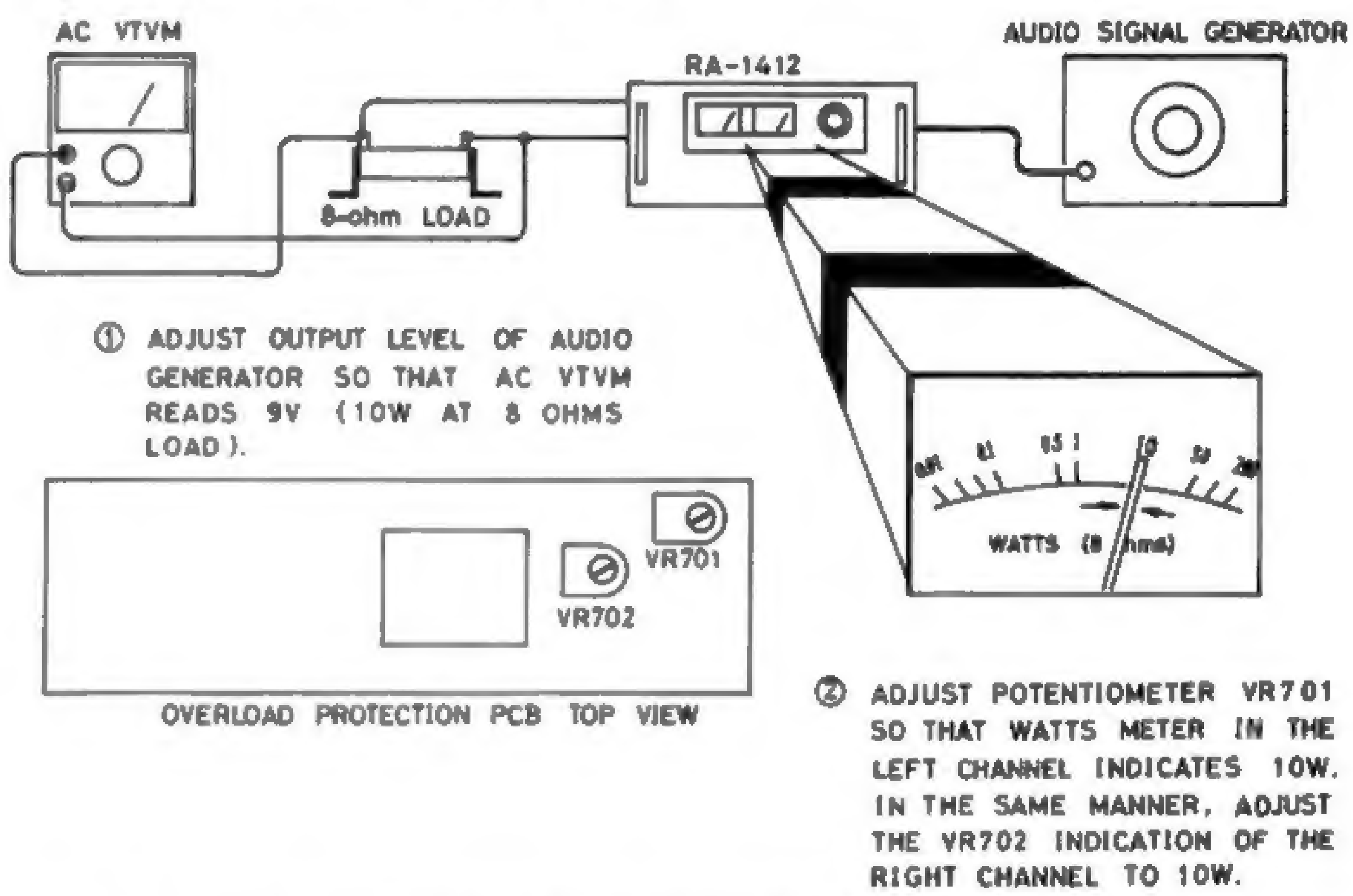


Fig. 5 WATTS METER CALIBRATION HOOK-UP

OVERLOAD PROTECTOR

I. The Overload Protection Circuit used in Model RA-1412 has the following two functions beside its basic function as an overload protection circuit.

1. To prevent low frequency noise from entering the speaker when Power Switch is set to ON.
2: To prevent residual sound (caused by discharging the power supply circuit capacitor which keeps the amplifier running) from entering the speaker.

II. Basic Function

A. To protect main amplifier, power supply circuit, etc. when output circuit (including speaker system) is shorted.
B. To protect speaker system from troubles occuring from shortcircuit of main amplifier circuit.
C. To protect main amplifier, speaker system, etc. from overinput signals entering main amplifier.

III. General Description of Protection Circuit Operation

A. If there is a short in the output circuit, the abnormality is detected by Q611 on the main amplifier circuit. When Q611 is closed, the gate voltage of thyristor D710 becomes (+), which closes D710 and activates Q703, and lowers the base bias of Q704. Then collector current is cut off, and protection relay is released to cut off speaker circuit from main amplifier circuit.
B. If there is a short in the main amplifier circuit, the abnormality is detected by transistor Q701 or Q702 on the protection circuit, either of which will be closed to raise the gate voltage of thyristor D710 to close D710. Accordingly, as in Phase A, collector current of Q704 is cut off, setting relay to OFF.
C. (1) If the intense input signal (causing middle point voltage of main amplifier to fluctuate by more

than ± 3V.) of low frequency range (under the time constant as determined by R709 and C705 +706, or R710 and C705 +706 of protection circuit) is applied to the main amplifier, Q701 or 702 of the protection circuit detects the abnormality. Succeeding operations are as in Phase A.

(2) If, under the operation with 4Ω load, a state exceeding the rated output occurs, Q611 causes D710 to close.

Note:

1. a) In the state of Phase B, the DC fuse will blow. Therefore if any abnormality arises in the left channel, power will not be supplied to either main amplifier or to other circuits, resulting in failure of illumination of overload indicator. (See circuit diagram). On the other hand, even if abnormality arises in the right channel, overload indicator will light up. (See circuit diagram.)
   b) In the state of Phase A or B, overload indicator will light up even if abnormality arises in either channel.
2. Setting abnormality detection level is done by VR603 of main amplifier circuit. See Section of Adjustment for Level Setting Condition and Method.

D. To restore protection circuit to normal, set Power Switch to OFF.

The instant the power switch is set to OFF, the interlock switch causes +B voltage of the protection circuit to be neutralized with −B voltage, to release relay circuit lock. If for some reason −B voltage is not applied to this circuit when power switch is set to OFF, the circuit remains in the OFF state of the relay even after the power switch is set to ON. (i.e. overload indicator will light up even while no abnormality is seen).

IV. Functions besides Basic Functions

A. When power is ON, bias voltage is applied to the base of Q704 in the relay circuit by the switch interlocking with power switch. The time required for the bias voltage to reach a level causing Q704 to close (to provide sufficient collector current to set the relay to ON.) is specified by the time constant, which is determined by R725 and C709 of the circuit and hfe of Q704. For Model RA1412, the time is set at approximately 7 seconds. This prevents noise, caused by rush current at the time of switching power to ON, from entering speaker.

B. When power is OFF, the base of Q704 is open by the switch interlocking with power switch and +b is neutralized with −b throughout the protection circuit.
Accordingly, the instant the power switch is set to OFF, the relay is restored to OFF state, cutting speaker from main amplifier. This prevents residual sound from entering speaker.

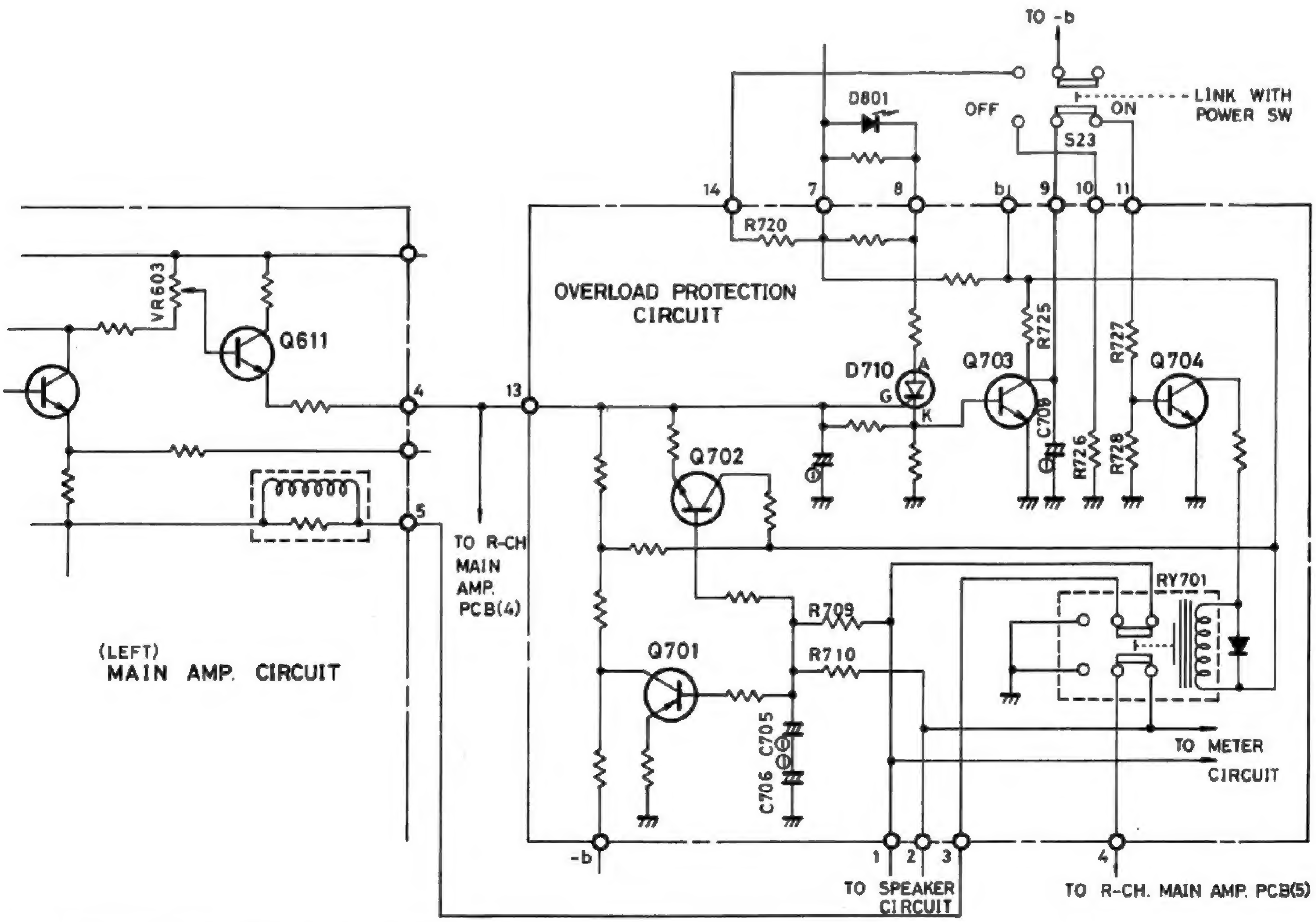


Fig. 6 OVERLOAD PROTECTION CIRCUIT

TROUBLE SHOOTING GUIDE

I. Unit Inoperative (both channels)

A. Meter lamp does not light up. → Check AC fuse, F001.

1. If AC fuse is blown.
   a. Primary or secondary winding of power transformer (T001)or T002) may be shorted.
2. If AC fuse is normal.
   a. Power switch may be faulty, or
   b. Primary winding of power transformer (T001) or the circuit connected to it may be broken.

B. Meter lamp lights up. → Check DC fuse, F901, 902, 903 and 904 (placed on the power supply PCB of each channel).

1. If F901 and/or 902 are blown.
   a. Capacitors C001, 002, 901, 902 or 903 may be shorted, or
   b. Rectifiers D901, 902, 903 or 904 may be shorted, or
   c. Transistor of power amplifier or main amplifier circuit (left channel) may be faulty. (In this case, overload indicator does not light up.)
2. If F903 and/or 904 are blown.
   a. Transistor of power amplifier or main amplifier circuit (right channel) may be faulty. (In this case, overload indicator lights up.)
3. If DC fuses are normal and overload indicator lights up.
   a. Output circuit may be shorted, or
   b. DC balance of the main amplifier circuit is disturbed greatly, or
   c. Abnormal signal is applied to the input of the main amplifier, or
   d. D710 of the protection circuit is closed by the failure of −B circuit, or
   e. −B voltage is not applied to the protection circuit by the failure of the switch interlocking with power switch.
4. If DC fuses are normal and overload indicator does not light up.
   a. Overload protection circuit may be faulty, or
      (1) Relay RY701 may be faulty (breaking of coil, failure of contacts),
      (2) Relay switch (interlocking with power switch) may be faulty.
   b. +B circuit may be faulty.

II. Either channel inoperative. → Check to see that signals are applied to PRE OUT terminal.

A. If signals come to PRE OUT terminal.

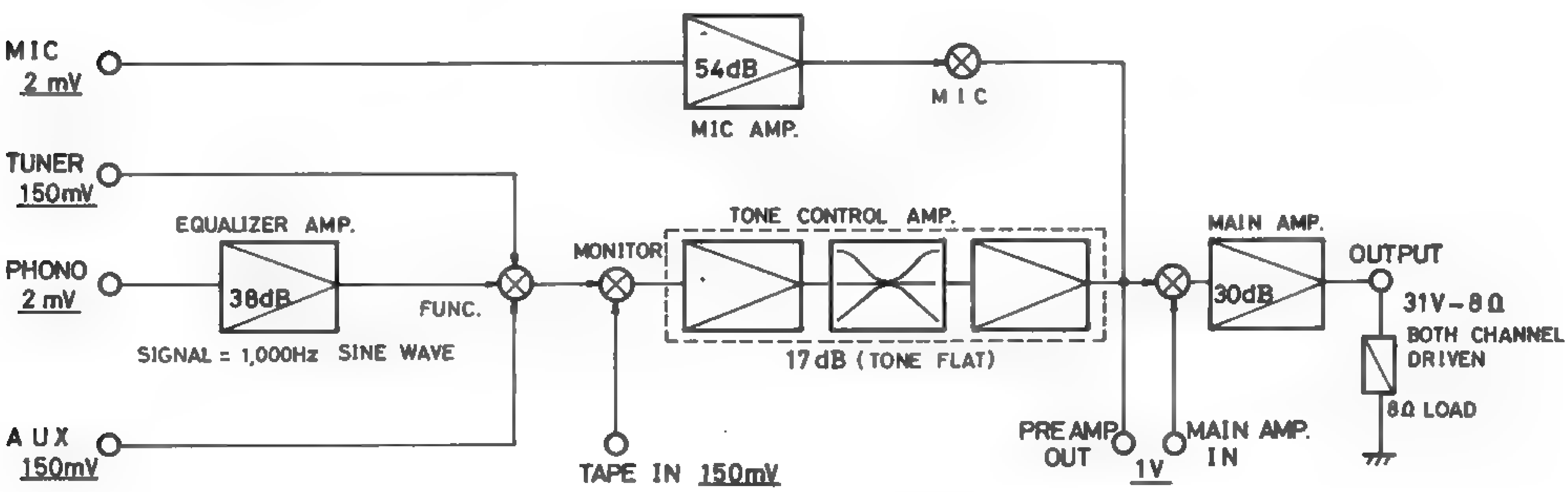
1. Main amplifier circuit may be faulty, or
2. Unit-separation switch may be faulty, or
3. Speaker switch may be faulty, or
4. Contacts of overload protection relay may be faulty, or
5. Power supply circuit may be faulty (*Note)
   a. Primary winding or secondary winding of power transformer T002 may be disconnected, or
   b. Capacitors C003, 004, 910, 911 or 912 may be shorted, or
   c. Rectifiers D506, 907, 908 or 909 may be shorted.

*Note: Section A.5. is the possible cause seen only when the right channel is inoperative. If trouble occurs in the power supply system of the left channel, both channels will become inoperative. (See I.B.1.a and b.)

B. If signals do not come to PRE OUT terminal,

1. Tone amplifier circuit is faulty,
   a. Check voltage of each transistor.
   b. Check each coupling capacitor.

GAIN DIAGRAM



CAUTION IN WIRING PORTIONS DURING REPAIRS

1. Output Terminal Portions.
   a. Once output terminal board has been removed, ground wire (wire running from Pin E1 and E2) from output circuit should be placed as shown in A in Fig. 7. (to prevent cross talking.)
   b. Blue (left channel) and green (right channel) lead wires coming from Main Amp PCB (5) running to Pin 3 and Pin 4 respectively on overload protection PCB should be lined up with ground wire (a) and twisted and wired as in (B) in Fig. 7.
2. Power Supply Circuit
   a. The lead wire coming from Pin 1 and Pin 2 on power supply PCB and going to Smoothing capacitor should be wired as shown in Fig. 8. (for both channels to prevent lowering distortion factor in high frequency range).

   *The figure shows the left channel case.
3. Volume Control Circuit
   a. Once volume control PCB has been removed, shield wire running from Pin 1 and Pin 2 of this PCB should be wired along the lower edge of separator wall in crevice as in Fig. 9. Never stretch wire directly across, unattached, as indicated by broken line in the figure.
4. Phono Amp Circuit
   a. Once Phono Amp. PCB has been removed, the lead wire (black) for compensating hum wired on the back side of the PCB, may have been disturbed. Therefore, after repairing and fixing PCB to the chassis, adjust the position of the lead wire using bakelite rod or the like, so that hum level comes within specified range for both channels. This can be done easily by wiring as shown in Fig. 10.

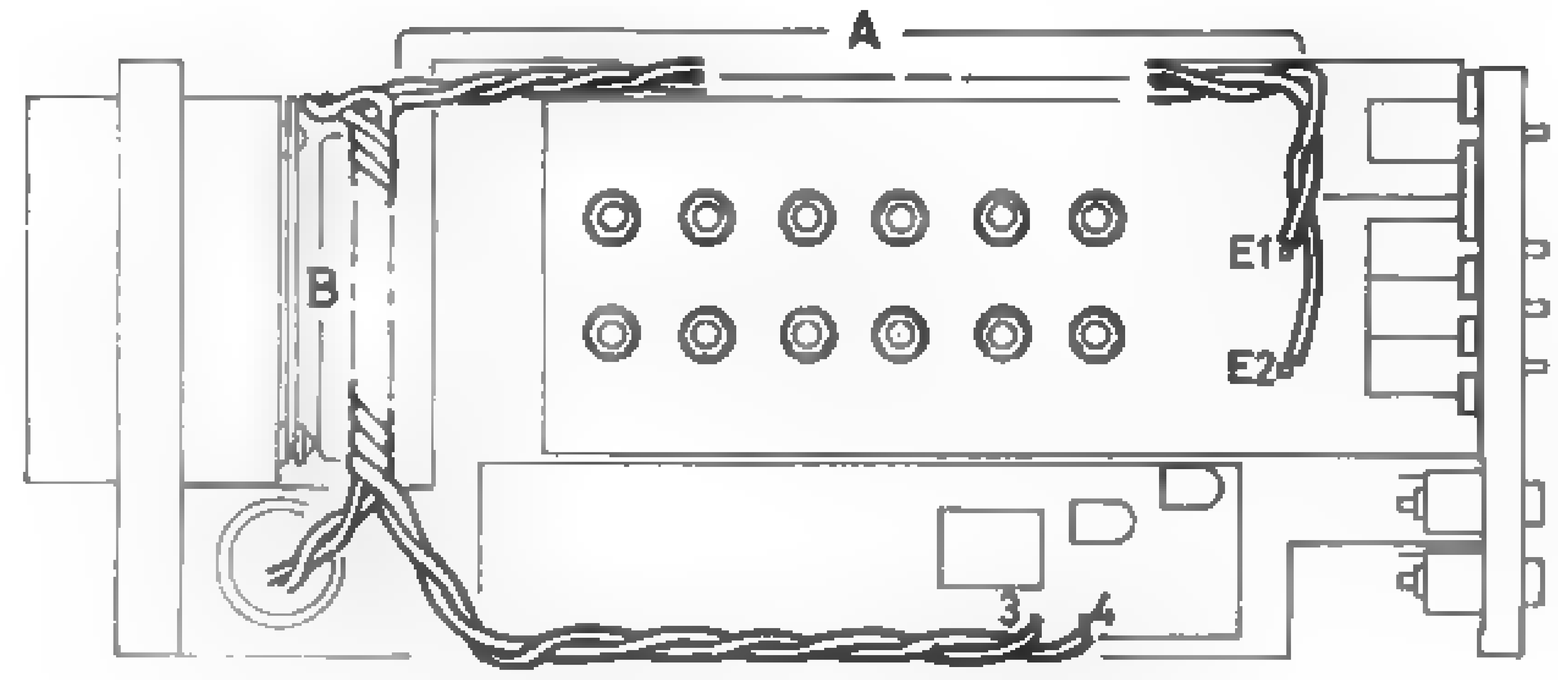
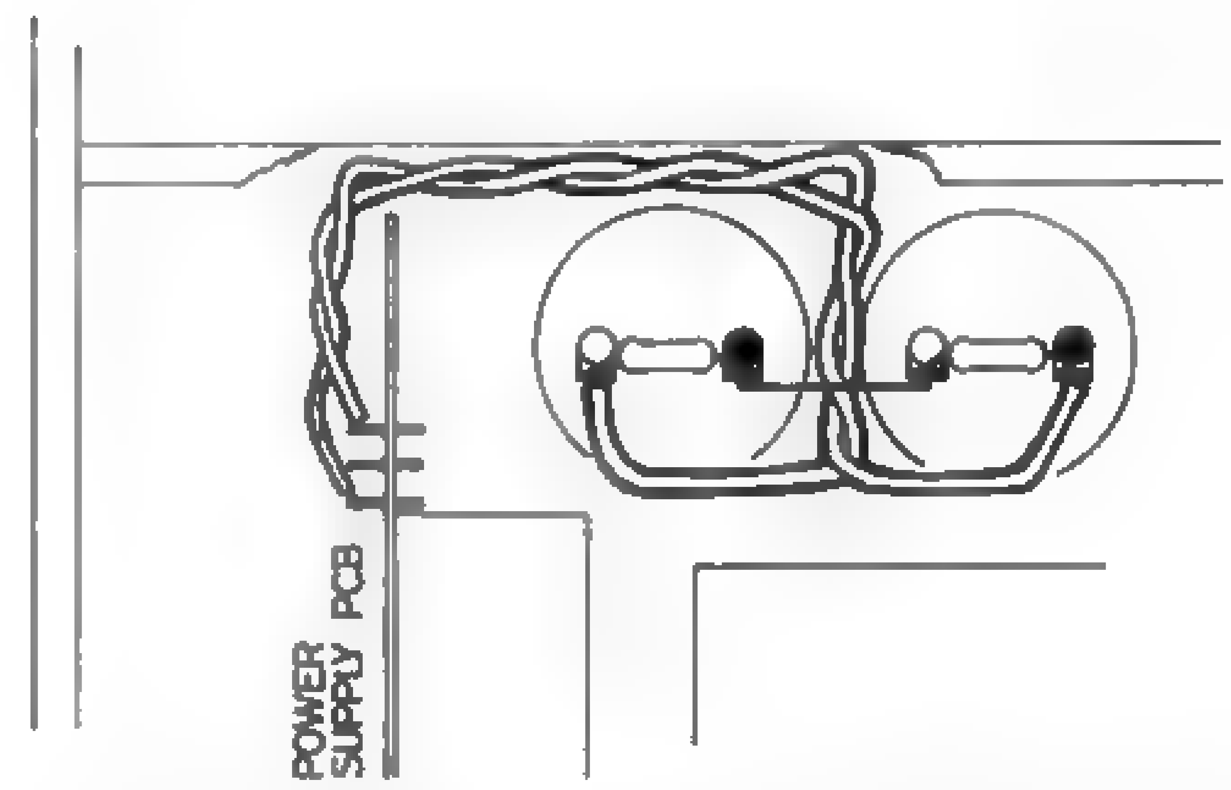


Fig. 7 WIRING DIAGRAM OF OUTPUT CIRCUIT



CHASSIS BOTTOM VIEW (POWER SUPPLY PORTION)

Fig. 8 WIRING DIAGRAM OF POWER SUPPLY CIRCUIT

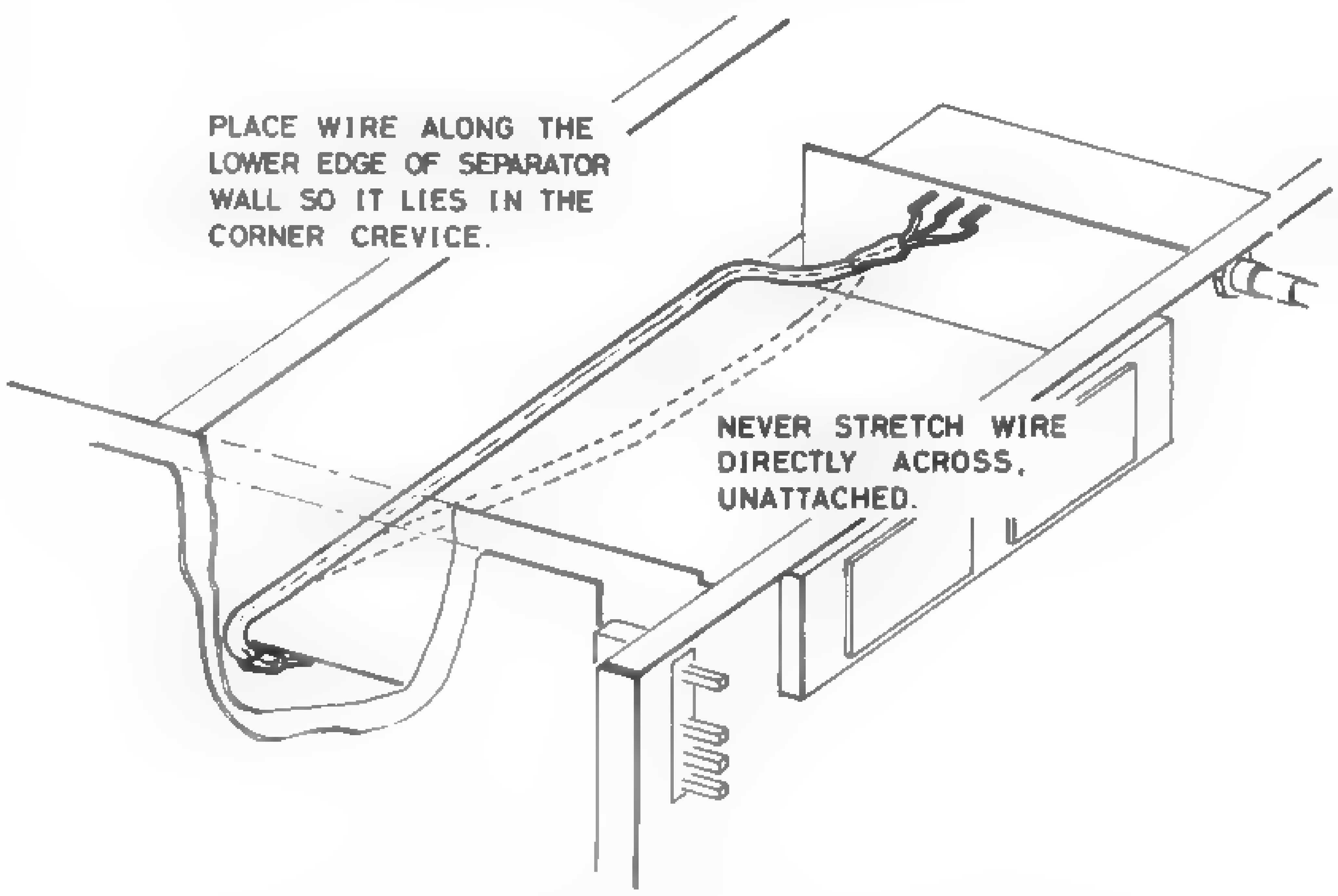


Fig. 9 WIRING DIAGRAM OF VOLUME CONTROL CIRCUIT

PHONO AMP. PCB (FOIL SIDE VIEW)

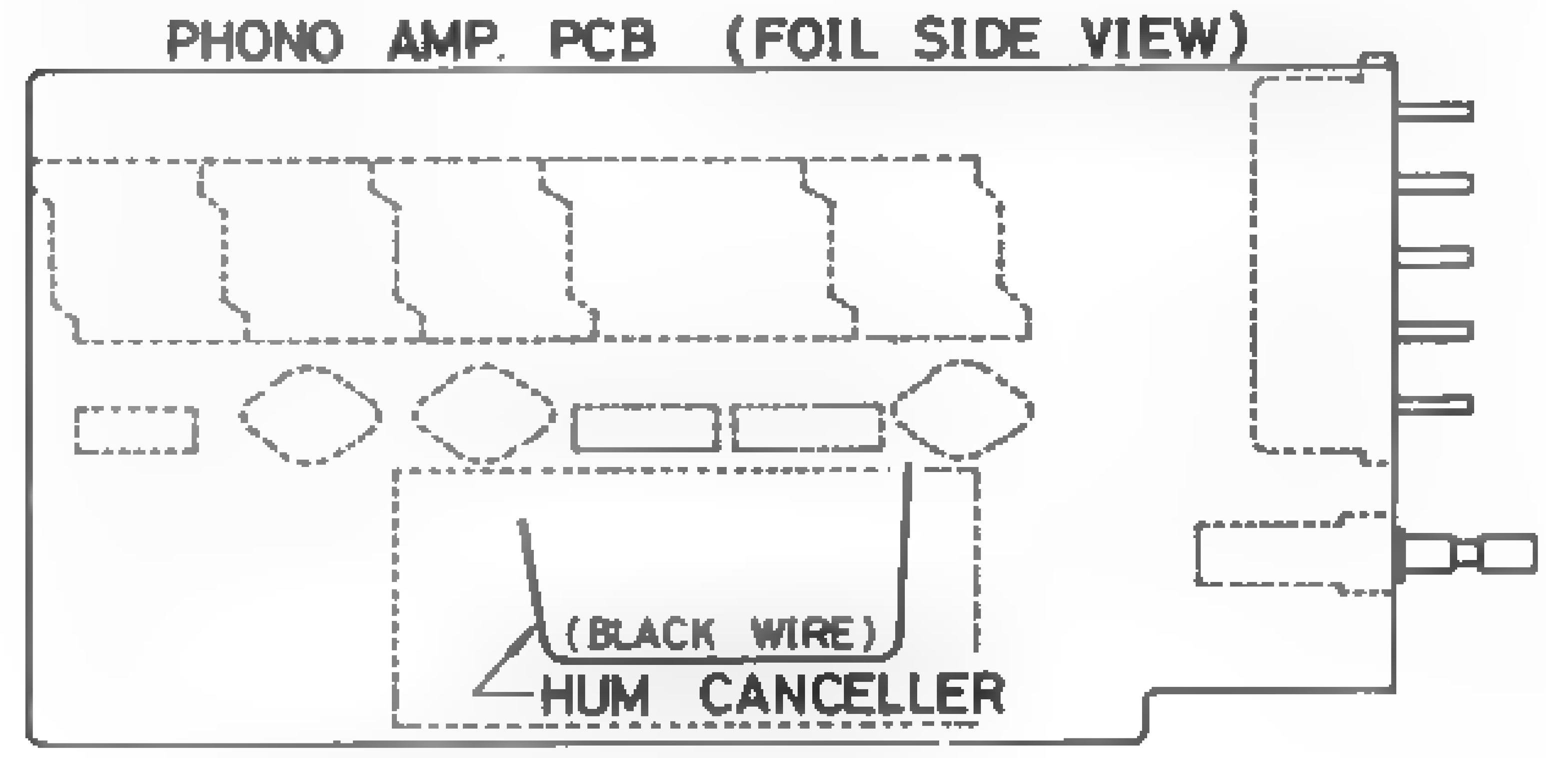


Fig. 10 PHONO AMP. CIRCUIT

SCHEMATIC DIAGRAM

ITEM	SCHMATIC LOCATION (LAST)
MAIN AMP.	R 642
	C 611
PROTECTION CIRCUIT	R 730
	C 708
OVERLOAD INDICATOR P.C.B.	R 801
	——
POWER SUPPLY	R 912
	C 917
CHASSIS	R 008
	C 005

(RESISTORS)
5% TOLERANCE UNLESS OTHERWISE NOTED
K--- KILO OHM
M--- MEGA OHM
▼--- COMPOSITION RESISTORS 1/2 WATT
NON MARK--LOW NOISE TYPE CARBON RESISTORS 1/4 WATT

(CAPACITORS)
M--- MYLAR FILM CAPACITORS
LN--- LOW NOISE TYPE CAPACITORS
PP--- POLYPROPYLENE FILM CAPACITORS
--- ELECTROLYTIC CAPACITORS
NON MARK-- CERAMIC CAPACITORS

- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
- VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 120 VOLT).
- VOLTAGE READING MAY VARY ±20%.

SCHEMATIC DIAGRAM

ITEM	SCHMATIC LOCATION (LAST)
PHONO & MIC. AMP.	R 4 6 3
	C 4 4 8
TONE CONTROL AMP.	R 5 1 4 6
	C 5 7 6

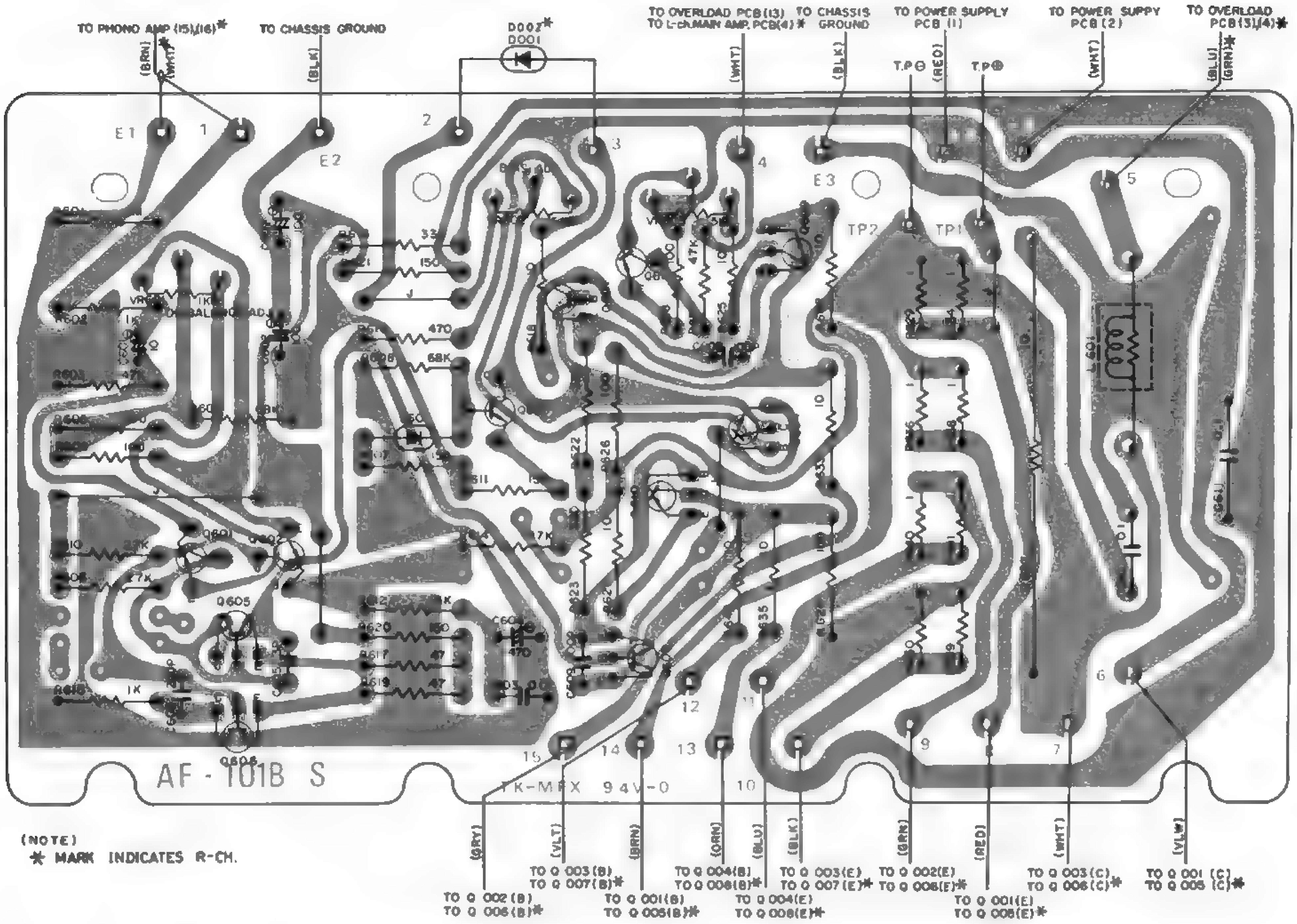
(RESISTORS)
5% TOLERANCE UNLESS OTHERWISE NOTED
K---KILO OHM M---MEGA OHM
---COMPOSITION RESISTORS 1/2 WATT
NONMARK---LOW NOISE TYPE CARBON RESISTORS 1/4 WATT
(CAPACITORS)
---MYLAR FILM CAPACITORS ---LOW NOISE TYPE CAPACITORS
---SINTERED ALUMINUM SOLID ELECTROLYTIC CAPACITORS (ALSICON)
---POLYSTYRENE FILM CAPACITORS ---TANTALUM CAPACITORS
---ELECTROLYTIC CAPACITORS
NONMARK---CERAMIC CAPACITORS

- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
- VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 120VOLT).
- VOLTAGE READING MAY VARY ± 20%.

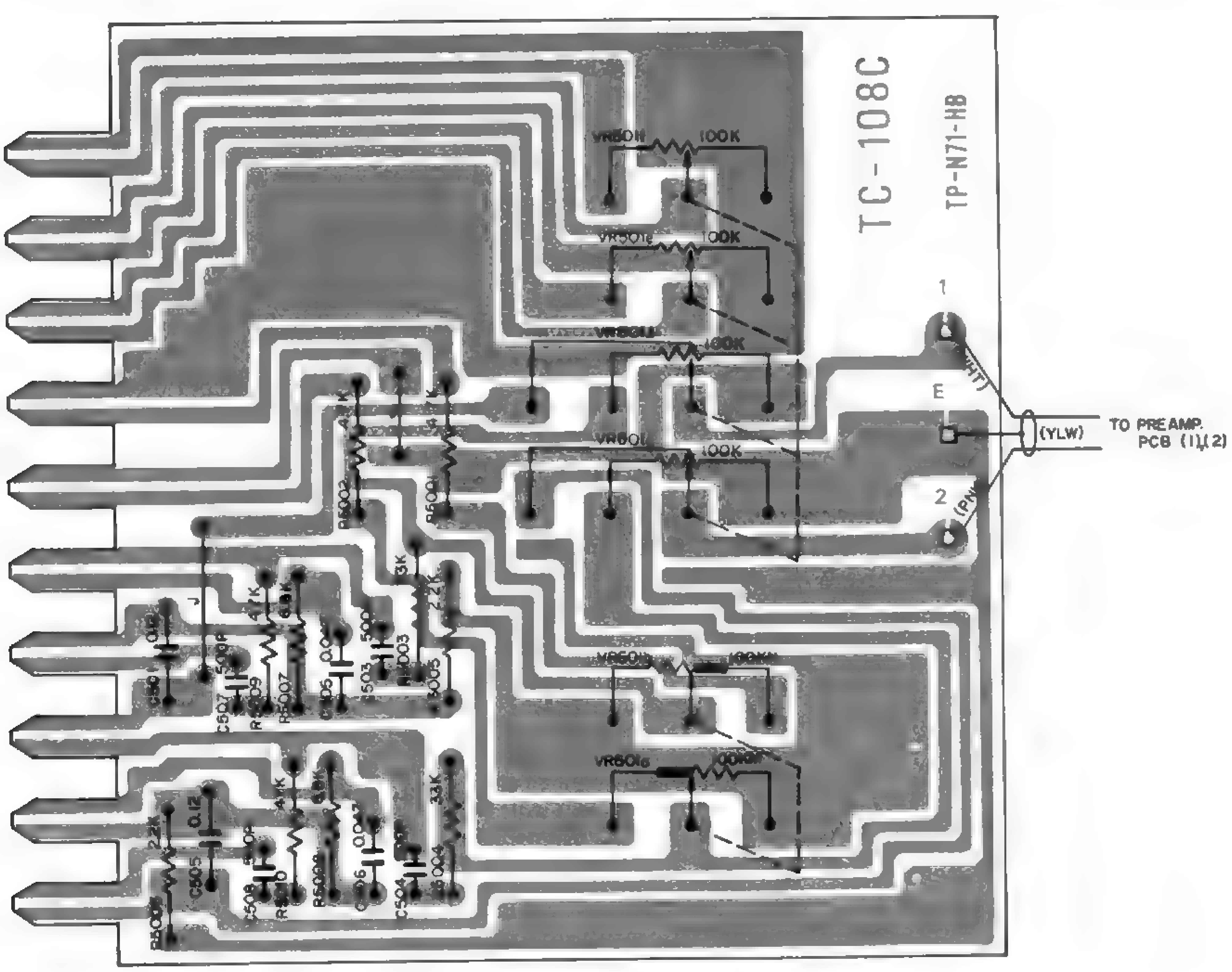
PRE AMPLIFIER CIRCUIT BOARD DIAGRAM

PHONO AMPLIFIER CIRCUIT BOARD DIAGRAM

MAIN AMPLIFIER CIRCUIT BOARD DIAGRAM

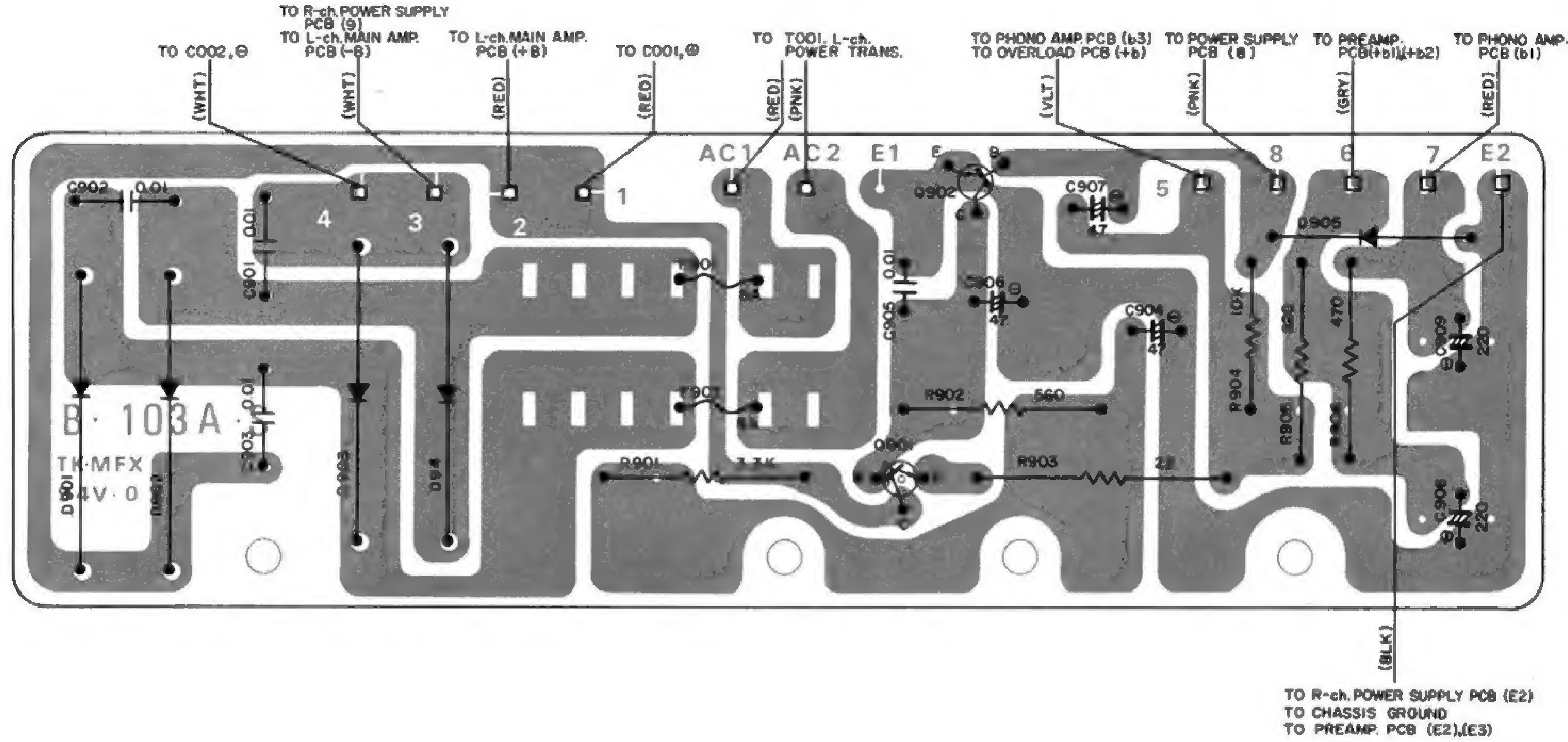


VOLUME CONTROL CIRCUIT BOARD DIAGRAM

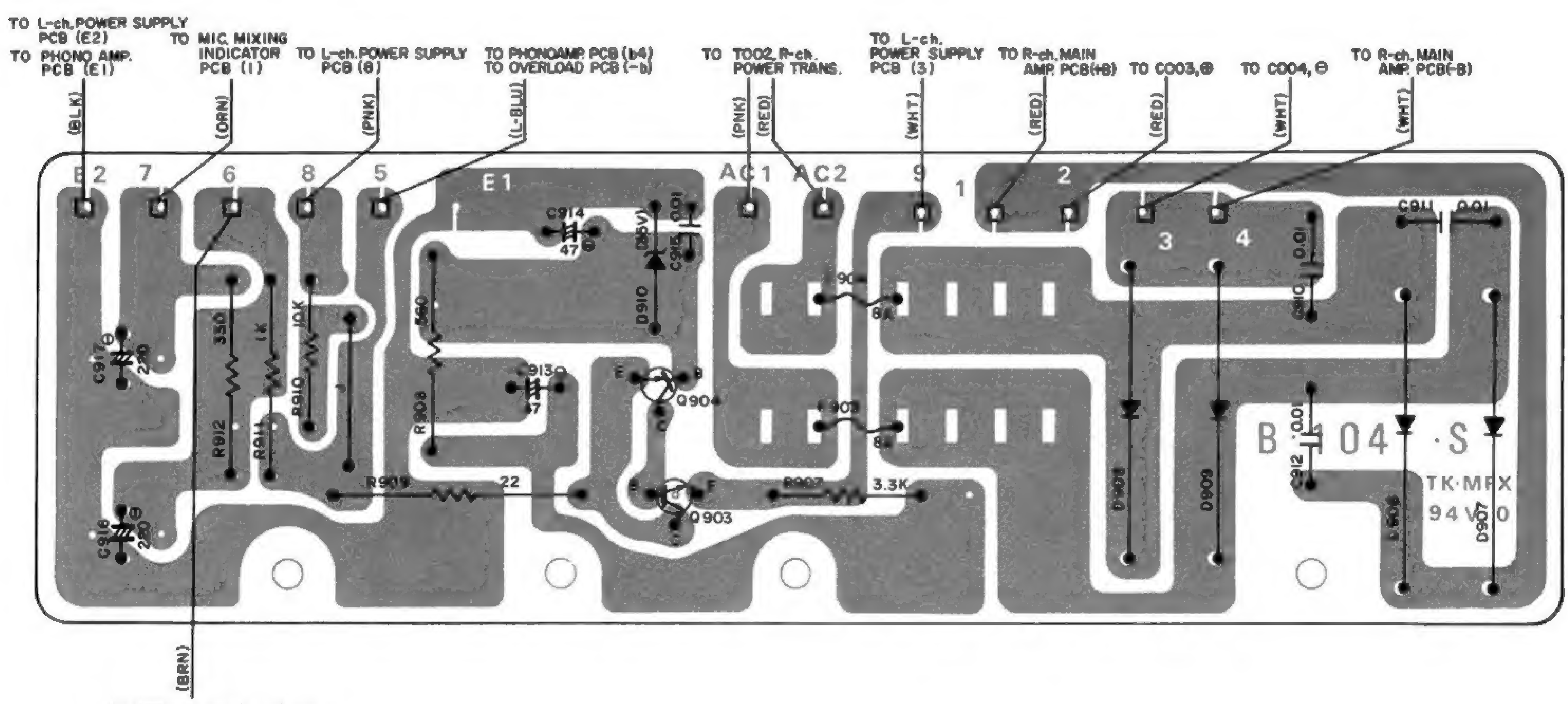


VOLUME & BALANCE CONTROL

POWER SUPPLY CIRCUIT BOARD DIAGRAM
(LEFT CHANNEL)



(RIGHT CHANNEL)



OVER LOAD PROTECTION CIRCUIT BOARD DIAGRAM

REPAIR PARTS LIST

Schematic Location	Part No.	Description
TRANSISTORS, DIODES AND IC		
Q401,402,403, Q404,501,502, Q503,504,507, Q508,511,512, Q513,514	301201156	2SC1222(E), Phono Amp., Tone Amp., etc.
Q405,406,409, Q410,601,602, Q611	301001134	2SA750-1-(E), Phono Amp., Main Amp., etc.
Q407,408	301201157	2SC1400(E), Phono Amp.
Q505,506,509, Q510,701	301001133	2SA750(E), Tone Amp., Overload Det., etc.
Q603,	301001138	2SA818 (Y or O), Main Amp., Bias Compensator.
Q604	301201132	2SC1384 (R or S), Main Amp., Bias Compensator.
Q605,606	301201161	2SC1628 (Y), Predriver.
Q607	301201161	2SC1628 (Y or O*), Sub-Driver.
Q608	301001138	2SA818 (Y or O*), Sub-Driver.
Q609	301201159	2SC1624 (Y or O), Driver Amp.
Q610	301001136	2SA814 (Y or O), Driver Amp.
Q702,703	301201115	2SC828 (R), Overload Protection Det., etc.
Q704	301201155	2SC1318 (R), Overload Relay Driver.
Q901,903,	301201142	2SC789 (Y), +B, –B Stabilizer.
Q902	301201132	2SC1384 (R), +B Stabilizer.
Q904	301001123	2SA684 (R), –B Stabilizer.
Q001,002,003, Q004,005,006, Q007,008	301301130	2SD426 (O or R), Power Amp.

Note 1: * indicates hfe designation (more than 100 hfe in "O" rank.) The hfe designation is marked with yellow.

Note 2: For transistors in Subdriver, Driver and Power Amplifier in the same channel, make sure to use the same hfe rank transistors in pair (for Power Amplifiers, all 4 pieces must have the same hfe rank.)

Example 1) In the case of Q609 and 610 in Driver stage.

a. 1) Use the combination of 2SC1624 (Y) and 2SA814 (Y).

2) Use the combination of 2SC1624 (O) and 2SA814 (O).

b. Never make combinations in which one is (Y) and the other is (O) rank.

Example 2) Use hfe rank transistors of same rank, from Q001 to Q004 (for right channel, Q005 to Q008), for example, in Power Amplifier. Never mix them.

However, it is possible to use "O" rank designation with yellow mark, in combination with the one of (Y) rank.

Reference

hfe range of "O" rank: 70-140

hfe range of "Y" rank: 120-240

"O" rank designation (with yellow mark): over 100 hfe.

Note 3: In this list, Part Nos. of the transistor, categorized in 2 ranks, are as follows:

a. For (Y or O): Part No. is represented by (Y) rank No.

b. For (O or R): Part No. is represented by (O) rank No.

c. For (R or S): Part No. is represented by (R) rank No.

Therefore, when ordering these transistors (carrying 2-rank designation), it may be preferrable to specify hfe rank required other than Part No.

Note 4: If the transistor carries only one rank, be sure to select that carrying correct hfe rank from among the same kind of transistors. (For example Q704 or Q902, etc.)

Schematic Location	Part No.	Description
TRANSISTORS, DIODES AND IC		
D301	300414007	SEL-105R, Mic. Amp, Indicator.
D401,402,501, D502,601	300212008	KB-165, Temperature Compensator.
D701,702,703, D704,705,706	300111008	1K188, Wattsmeter Rect.
D707,708,709	300111010	1S2473, Watts Meter rect., etc.
D710	300515001	2SF656, Overload Protection Trigger.
D801	300414006	SEL-101R, Overload Indicator.
D901,902,903, D904,906,907, D908,909	300919020	ERD03-02, Rectifier.
D905	300919008	SM-1-02, Bias Setter.
D910	300313019	WE-350, Bias Setter.
D001,002,	300212012	SV-04F, Temperator Compensator.
IC	303452152	RC-4558, Mic. Amp.
VARIABLE RESISTORS		
VR401	525101133	50KB x 2 w/Switch, Mic. Level Control. w/Mic. Switch
VR501	525121133	100KMN + 100KT x 2 + 100K x 2, Balance & Volume Control.
VR601	510502119	1KB, DC Balance Adj.
VR602,603	510502121	5KB, Bias Adj., Overload Protection,Level Adj.
VR701,702	510502126	10KB, Watts Metter Level Adj.
SWITCHES		
S1,2,3,4,5, (1 Set)	614051014	Push 5-Key Function Selector.
S6,7	613000026	Phono Input Impedance, Sensitivity Selector.
S8	————	**Ref. Variable Resistor VR401**
S9	601011273	Tape Monitor.
S10	601011275	Mode
S11,14,16,17,	611001638	Loudness, Bass Turnover, Filters.
S12,15	601011277	Treble, Bass Control.
S13	611001639	Treble Turnover.
S18	611001637	Muting.
S19	613000025	Unite-Separate Switch.
S20,21,22,23 (1 set)	614040816	Speakers Selector and Power Supply.
	614040817**	Speakers Selector and Power Supply.

Note 5: Switches with(**)are used only in those units of BS and SEMKO standards: Power switch specifications are different.

Schematic Location	Part No.	Description
		OTHERS
RY701	240111226	Relay, Overload Protection, DC24V.
M001,002	231310057	Watts Meter
T001,002	205001392	Power Transformer, (Multi-Voltage)
	206001392□1	Power Transformer, (220V-240V)
	201001392□2	Power Transformer. (120V Only)
Note 6: □1 is used only in those units of BS and SEMKO standards.		
□2 is used only in CSA approved units (for Canada).		
	141510150	Phono and MIC. Amp Circuit Assembly.
	141710266	Tone Control Amp. Circuit Assembly.
	141710267	Volume Control Circuit Assembly.
	141810627	Left Channel Power Supply Circuit Assembly
	141810628	Right Channel Power Supply Circuit Assembly
	141610273	Main Amp. Circuit Assembly
	141810629	Overload Protection Circuit Assembly
	141810630	Output Circuit Assembly (WO/Push Switches)